Better Crops WITH PLANT FOOD

March 1950 10 Cents

The Pocket Book of Agriculture

INTRODUCING the New

AGRICULTURAL PENTAHYDRATE BORAX

The introduction of this new product to the agricultural trade represents an achievement in product research and development designed to provide a high analysis fertilizer grade Borax at minimum cost.

CHARACTER OF PRODUCT Contains a minimum of 44% B_2O_3 or approximately 121% equivalent Borax.

ADVANTAGE More economical because the Borate which comes to you in this form is more concentrated.

PURPOSE To correct a deficiency of Boron in the soil and thus enhance the productivity of crops.

RECOMMENDED USES As an addition to mixed fertilizer, or for direct application to the soil.

FOR CORRECT APPLICATION Consult your local County Agent or State Experimental Station.

A member of the well-known "Three Elephant" Boron product family.

AMERICAN POTASH & CHEMICAL CORPORATION

122 EAST 42nd STREET • • • NEW YORK 17, N. Y.

231 S. LA SALLE STREET
CHICAGO 4, ILLINOIS

214 WALTON BUILDING
ATLANTA 3, GEORGIA

3030 WEST SIXTH STREET
LOS ANGELES 54, CALIF.

"Pioneer Producers of Muriate in America"

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIV NO. 3

TABLE OF CONTENTS, MARCH 1950

Here Overstecken! 3
Jeff Tells About His Trip to Holland

Soil Testing in Georgia Is Rolling Onward 6
L. C. Olson Describes the Mobile Soil-testing Unit

Metering Dry Fertilizers and Soil Amendments into Irrigation Systems 8
F. S. Fullmer Explains Recent Developments

Food for Thought About Food 15
Conclusion of Discussion by F. E. Bear

Better Safflower Is Here 21
C. B. Sherman Discloses New Developments

Extension Education in Soils in Wisconsin 22
History of Work Reviewed by C. J. Chapman

Can We Afford Enough Fertilizer to Insure Maximum Yields? 26
L. G. Zinn Provides the Answer

The American Potash Institute, Inc.

1155 16th Street, N. W., Washington 6, D. C.

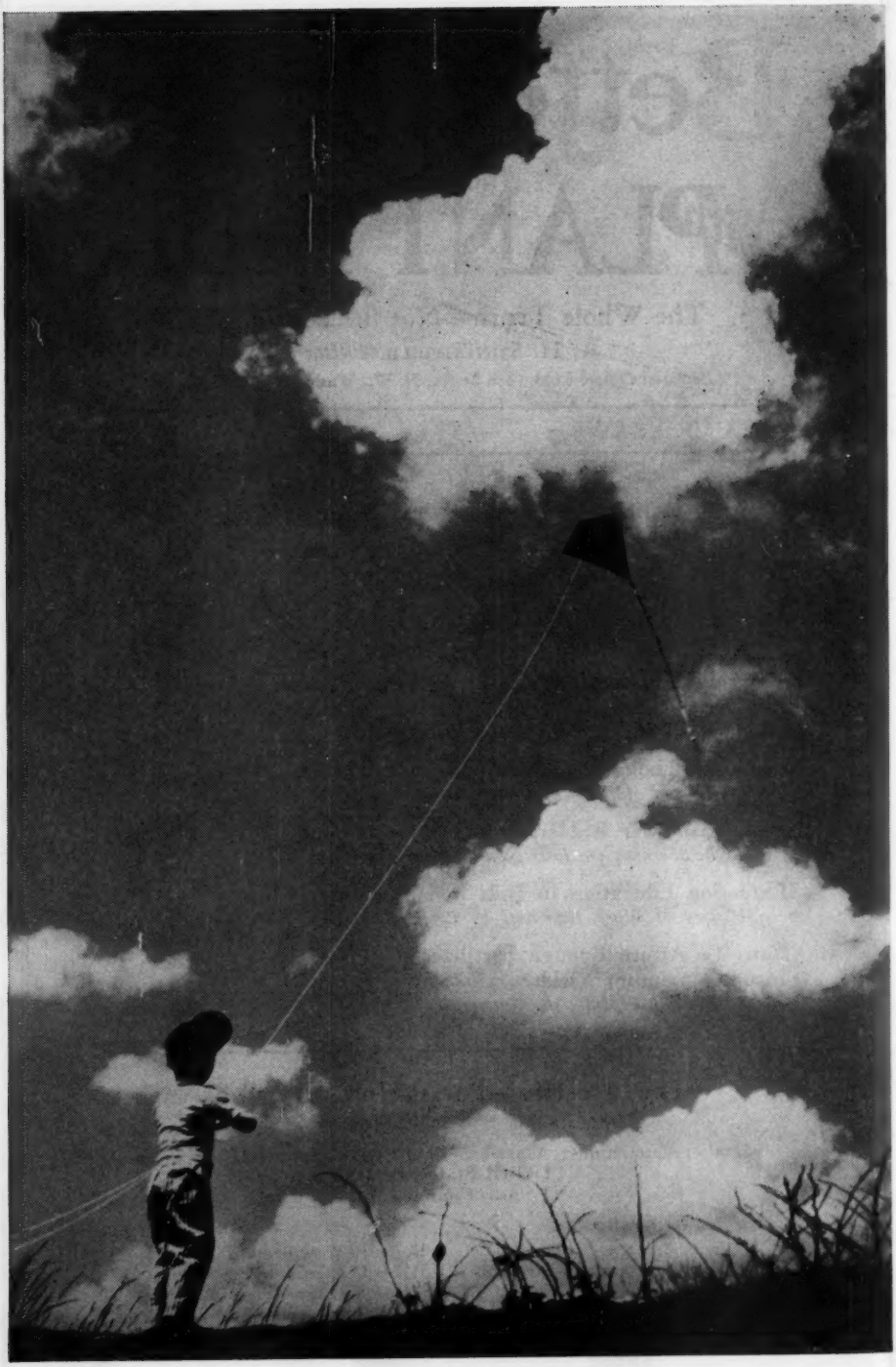
Member Companies: American Potash & Chemical Corporation
United States Potash Company
Potash Company of America

Washington Staff

H. B. Mann, *President*
J. W. Turrentine, *President Emeritus*
J. D. Romaine, *Chief Agronomist*
R. H. Stinchfield, *Publications*
Mrs. H. N. Hudgins, *Librarian*

Branch Managers

S. D. Gray, *Washington, D. C.*
J. F. Reed, *Atlanta, Ga.*
G. N. Hoffer, *Lafayette, Ind.*
M. E. McCollam, *San Jose, Calif.*
E. K. Hampson, *Hamilton, Ont.*



Reserved—Young Men Only

Better Crops with PLANT FOOD

PUBLISHED BY THE AMERICAN POTASH INSTITUTE, INC., 1155 SIXTEENTH STREET, N.W., WASHINGTON 6, D. C., SUBSCRIPTION, $1.00 FOR 12 ISSUES; 10¢ PER COPY. COPYRIGHT, 1950, BY THE AMERICAN POTASH INSTITUTE, INC.

VOL. XXXIV WASHINGTON, D. C., MARCH 1950 No. 3

Dutch Farmers Say . . .

Here Overstecken!

Jeff McDermid

WHEN you're in Holland you do as they do in the Low Countries —you obey the signs at street crossings and bridgeheads that say: "Here Overstecken," (Step Across Here). The doughty Hollanders are always "overstecking" their canals. Some canals curve and meander through ancient city streets that remind you of the craftsmen of the Hanseatic League, buildings with high peaked roofs and neat and weatherworn half-timbered gables having sturdy projecting beams for elevating heavy loads to upper floors. These urban canals are alive with chugging boat traffic—even brilliant flower barges. Their sidewalls are well buttressed, while the stone pavements slope down to the watercourses, as a rule without any barriers to stop a headlong plunge. (Probably these Dutchmen never get dizzy.)

These weaving city canals often boast arched bridges and also an occasional set of locks. But the canals out in the level, verdant open countryside are usually straight as a ruler, with grazing cows, a few goats, and the fast diminishing windmills to make the tourist remember the blue designs on his delftware. Here, as in the cloistered towns that reflect the Middle Ages but live very much in the present, there are always the bridges and the tiny single catwalks thrown across the rural waterways.

I regard this happy phrase I have chosen at random—Here Overstecken —as a real symbol of the purposeful attitude and the devotion and courage

of the Netherlands. Despite all injustice and the war's grievous blunders and ruination, and in the face of setbacks and disconcerting events, the Holland spirit steps over and across them all to a fresher and a better opportunity—even if it has to start all over again. No matter what comes, the Dutchman will always "overstecken," and keep his feet dry besides.

I dare say that Holland grows good field and forage crops and milks cows on types of "sunken" land that would not be considered a safe risk for most American drainage experts. I know that they grow excellent crops on other soil types of silt and sand that are above the water line, yet still would not be regarded with much favor by knowing farmers of our land.

I also know by observation that they diversify and develop and engineer things with a baffling skill and sturdy spirit of cooperation which make for rapid recovery from a series of disasters that our own country has, fortunately, thus far escaped.

I likewise know from personal touch that too little of the real Holland is known in America, where our ideas have been taken from old prints and old stories—some of them of doubtful truth. For example, I tried very hard to locate some genial Dutch informer who would verify the legend oft told me in my classrooms about Hans, the heroic boy in wide breeches and wooden shoes, who found a treacherous break in the dyke one evening, and who stuck his finger in the hole and kept it there all night long—finally saving the town from washing away and thereby becoming the toast and the boast of the era. One and all, they shook their sage heads and smiled. "Never heard of it."

But for every disappointment at the loss of a legend, we gain genuine admiration for the things which are true —and Holland is indeed a nation of builders and dreamers who make the most of everything and never think of depending on others as long as their own will to do and the materials at hand can turn the trick.

Just within the few days we spent in the picturesque rural areas of the peninsula north of Haarlem and Amsterdam, we easily proved the old truism that fact is stranger than fiction. First off, we went to the largest flower auction market in Europe, located at Aalsmeer. Barges loaded with gorgeous bloom ply the ancient canals and newer waterways, all moving to Aalsmeer's cooperative salesrooms, and there are joined by countless overland trucks heaped with the roses, carnations, dahlias, and mums, to be taken before the buyers in the amphitheater.

From there we left with regret to study the farming practices on one of the older reclaimed areas of Holland, called Haarlem meer polder, where we clustered around P. K. Kistemaker in a storage shed to hear him relate the early trials of those who did the first farming and soil improving there. Afterwards we went to learn a little more about the quality of the cattle and the methods of keeping records on them, taking Ruiter Bros. ranch near Oosterblokker adjacent to Hoorn as an example.

AT the midday interval we all sat around long tables in the hotel at Middenmeer, where we partook of a delicious luncheon with ample portions of that mild looking potage with a wallop in it, sometimes call schnapps. We wondered if Rip Van Winkle derived his twenty years rest from copious draughts of a similar Dutch liqueur. The display of crops and forages raised on the polder of Wieringermeer engaged our immediate attention while we heard the remarkable story of the way in which this war-flooded zone of 50,000 acres had been restored to agriculture within a year after the ravaging tide of silt-laden debris had been drained off again.

To reclaim the Zuider Zee in the name of agriculture is a far different

method of "claiming" new empires than existed when men sailed to distant lands and planted flags on lonely beaches. In many ways, the Dutch method of creating new land out of the floor of the ocean itself is a more creditable performance than that of Cortez or Columbus perhaps. It would at any rate be a fine subject for one of those educational debates which

we often engaged in back in our high-school days.

To turn the great watery areas of the mammoth Zuider Zee into new acres for man's subsistence required modern engineering applied to jobs that began away back in the 12th and 13th centuries—when the Hollanders of that distant era began to reclaim northwestern estuaries. First, to stop the encroachment and the pressure of the ocean itself, they built a huge enclosing dam of concrete and steel running from the North Holland coast at the westward, via Wieringen Island, out eastward to the Friesian coast. We stood on top of that mighty rampart, erected not to defend against guns and bombs, but to protect the land to be drained and fertilized so that mankind might partake more generously of the food that nature provides. I was far more thrilled with this great stretch of masonry mileage than I was at seeing some pillboxes on the old Siegfried line.

Having shut off the wildest waves and set up valves to control them and to let water in and out at will, the planners fell to with a vim and plotted out the Wieringermeer polder and three other ones in that area, the last of which is being finished with Marshall Plan aid. The entire project will when completed add 543,000 acres to the productive power of this ancient, aquatic land. Temporarily the most of the wheat, oats, barley, hay, and truck crops raised thereon are under Government account but many population centers are growing fast and farms are being leased to qualified operators—with all buildings erected under official supervision. Cattle are not relatively numerous thus far in the reclaimed zone, although the lighter sandy areas seem to have more of them than the heavy loams and clays suited best to staple food crop production.

Within the present century the population of Holland has almost doubled. No wonder they hunt for more food in peaceful fashion by making the most of the least, or as our 4-H clubbers say, by "making the best better." During this interval of 50 years, in which the consumers grew from 5 million to 10 million, the productive food area of the country increased but 11 per cent. Even with the newly created farm land in the Zuider Zee polders, it leaves the nation with less than 6½ million acres suited for the plow. Hence each hungry mouth in Holland has less than three-fourths of one acre to support its needs. And by all the best authorities we consulted over there, the limit to further expansion has been nearly reached.

YET with a population so crowded that there are 700 persons to the square mile, the Netherlands has maintained its outstanding record for high quality agricultural goods and a very intensified and successful farm-management system. Moreover, this situation has been the reason for a high degree of specialization—experts in seeds, nurs-

(*Turn to page* 48)

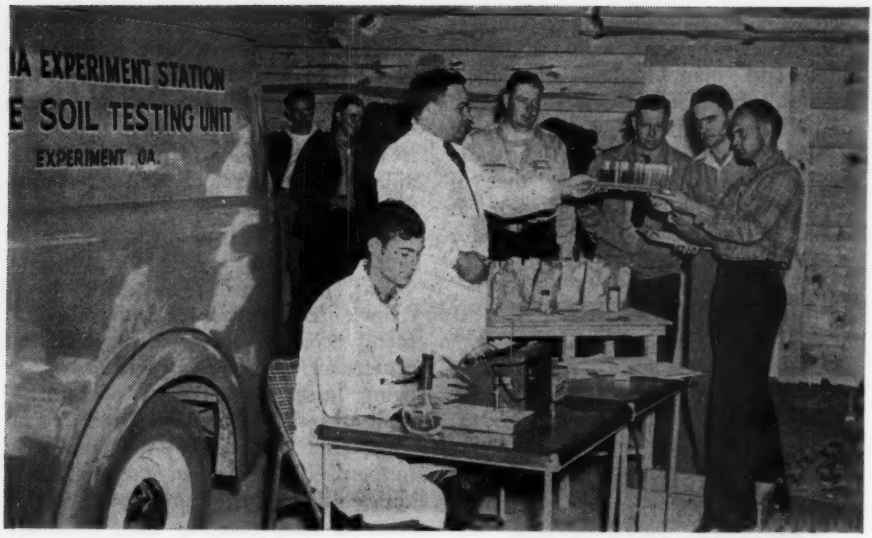


Fig. 1. The author and his assistant testing soil for a group of farmers in Madison, Georgia.

Soil Testing in Georgia Is Rolling Onward

By L. C. Olson

Soil Chemist, Georgia Experiment Station, Experiment, Georgia

SINCE the soil-testing program was begun at the Georgia Experiment Station in 1938, its popularity has grown rapidly. During the early years of this service only a few hundred samples were analyzed annually for fertilizer and lime requirement, but during the last few years 15,000 to 20,000 samples are tested each year. This work is done in two laboratories, one at the Experiment Station at Experiment, and the other at the College of Agriculture in Athens.

There are several reasons for the increased demand for this service by the farmers and growers of the State. Without the use of reliable methods of analysis and accurate interpretations of the results based upon a large number of field experiments, this program doubtlessly would have been a failure. In changing over from crops such as cotton and corn with which they were familiar to pasture and truck crops, growers have had to rely on soil tests and other information to determine the fertilizer and lime needs of these new crops. A general educational program in Georgia as well as in surrounding states has further pointed out the importance of soil testing to the farmer.

For the most part the soil-testing program in Georgia is similar to that being carried on in other states in the Southeast. Tests are made without cost to residents of the State for acidity,

nitrogen, phosphorus, potassium, calcium, magnesium, manganese, and aluminum. A large percentage of the samples are collected by county agricultural agents, Soil Conservation Service personnel, teachers of agriculture, and other trained agriculturalists, although more and more farmers are becoming interested in collecting their own samples. Schools and short courses for the purpose of instruction in collecting soil samples are conducted in various parts of the State periodically.

Results of the chemical analysis together with an interpretation of the results and recommendations for the specific crop to be grown are sent out for each sample submitted. In the laboratory, the data for each sample are recorded on cards which are filed according to county. From these cards valuable information regarding the fertility status of the soils in various sections of the State has been obtained.

A recent innovation in soil testing in Georgia has been the introduction of a Mobile soil-testing unit. This unit, which is housed in a standard commercial panel truck, was put into operation on October 17 of last year. Since that date, 25 counties have been visited and several thousand samples analyzed in the unit. This laboratory is equipped with standard laboratory soil-testing equipment and the same tests are made on the truck as are made in the laboratory. One technician and one agronomist have been analyzing from 75 to 100 samples daily in this truck, and sufficient chemicals and supplies are carried for one week's operation.

Mobile Unit a Time-saver

One of the chief advantages of the Mobile soil-testing unit is that of saving from one to two weeks' time in getting the results of the analysis back to the farmer. The truck is located at a central point in the county and farmers bring their samples to the truck. While they wait, their samples are analyzed and the results and recommendations given to them. The educational value of this procedure is important. Many farmers have been convinced of the value of soil analysis by seeing their samples tested. Another advantage of this method of soil test-

(*Turn to page* 45)

Fig. 2. L. C. Olson giving recommendations for fertilizing pastures to C. E. (Tiny) Williams, Griffin, Georgia, well-known Angus breeder.

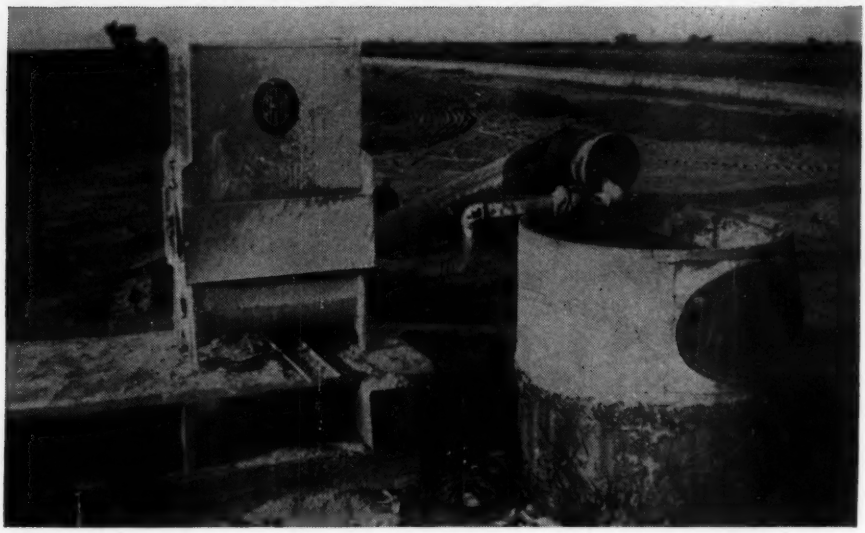


Fig. 1. Prizer Gypsum and Fertilizer Applicator set up to meter dry materials by water power alone.

Metering Dry Fertilizers and Soil Amendments into Irrigation Systems

By F. S. Fullmer

Corona Del Mar, California

THE application of dry fertilizer and soil-amendment materials through the irrigation system has increased rapidly in many sections of the West during the last few years. Although the first applicator capable of metering measured amounts of dry fertilizer materials into the irrigation stream was developed and patented 20 years ago, many of the advantages of this type of machine were not recognized until recently. During this early period the interest was mainly confined to the use of dry nitrogen materials. Even then, however, the use of anhydrous ammonia overshadowed this practice.

A number of factors have contributed to the recent development and use of machines designed to meter known amounts of dry fertilizer and soil-amendment materials into irrigation water. One is the marked increase in the use of nitrogen solutions, liquid phosphoric acid, liquid mixed fertilizers, and liquid soil amendments, in California, during the past few years (Table 1). The cost of equivalent amounts of nitrogen in the form of anhydrous ammonia and nitrogen solu-

tions is approximately the same as that derived from dry nitrogen materials. However, in most cases, the water-soluble dry carriers of phosphate and potash can be applied at a much lower cost than the comparable liquid forms.

Within the last five years the Agricultural Extension Service of Kern County, California, working with the Department of Irrigation, University of California, found that under certain conditions adverse water and soil characteristics could be most effectively remedied by the application of gypsum to the irrigation water. As a result of this work, more than 500 gypsum applicators have been built and are now in use in Kern County. Irrigation water in this section is pumped from deep wells and most of the applicators are set up as a permanent installation, although there are a number of portable machines, that service a number of wells, now in use. Soluble dry fertilizer materials can be easily applied to the irrigation water through these same machines, and many growers are using the applicators for this dual purpose. The corrosive action of fertilizers, however, requires that the machines be thoroughly washed out after each use.

All chemical nitrogen and potash fertilizers can be satisfactorily applied through irrigation water, but the water-soluble phosphate materials are limited to ammonium phosphate (11-48-0) and ammonium phosphate-sulphate (16-20-0). The lack of adequate supplies of these soluble phosphates, during the past few years, has restricted the manufacture and use of water-soluble dry mixed fertilizers, but it appears that they will be more available in the future. Single and triple superphosphates have been used in open ditches, but the advisability of the application of these materials through closed irrigation systems is questionable.

There are two main types of machines available for the water application of dry fertilizers and soil amendments. The first type can, under many conditions, be operated entirely by water; while the second type is partially, or wholly, dependent upon power from other sources.

The Prizer Fertilizer and Gypsum Applicator (Fig. 1), manufactured by the Hooper Machine Works, Inc., Bakersfield, California, is an improved version of the original machine patented almost 20 years ago. A 2-inch intake pipe, with a control valve, conveys the water to one side of a double trough mounted on a pivot, which allows the trough to swing when one side is filled, bringing the other side into position for filling. The oscillations of the trough are communicated to a "shaker" at the base of the hopper which sifts a thin layer of fertilizer or gypsum into a basin below the double trough. The material is then washed, by the water from the dippers, into the discharge pipe. The rate of application is controlled both by the size of the slit above the "shaker" and the

TABLE 1.—TONNAGE OF LIQUID FERTILIZERS AND SOIL AMENDMENTS SOLD IN CALIFORNIA, 1943-1948, AS REPORTED BY THE BUREAU OF CHEMISTRY—CALIFORNIA DEPARTMENT OF AGRICULTURE

Year	Liquid Phosphoric Acid	Nitrogen Solutions	Liquid Mixed Fertilizers	Lime Sulphur	Sulphuric Acid
1943	1,101	.....	967	.....	.....
1944	1,532	422	2,170	.....	.....
1945	2,552	1,722	4,310	.....	.....
1946	3,574	3,978	5,200	.....	.....
1947	5,174	8,883	7,744	.....	.....
1948	3,233	11,977	10,732	3,783	10,593

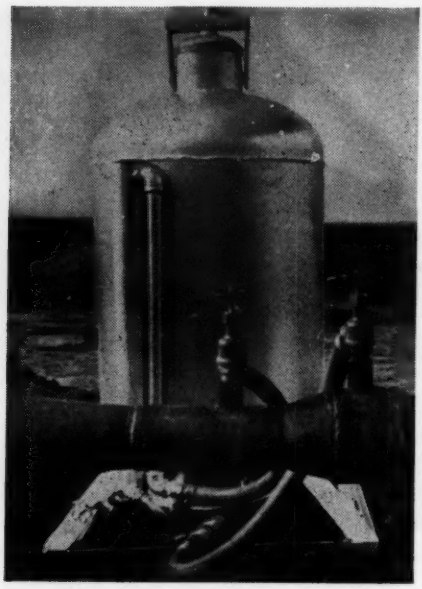


Fig. 2. Prizer "600" Pressure Type Applicator operating on 5-inch pressure line.

number of oscillations per minute of the trough, which is determined by the amount of water entering the intake pipe.

There are two sizes of the Prizer Applicator now being manufactured, and both are made from aluminum with monel bearings on the trough. The smaller model, which weighs 58 pounds, will hold approximately 650 pounds of gypsum, and with 11 complete oscillations of the double trough per minute, will apply a maximum of 400 pounds per hour. A larger model that weighs 120 pounds, and will hold 1,200 pounds of gypsum, will apply a maximum of 600 pounds per hour. By decreasing the amount of water entering the intake pipe, the machines will deliver as low as 20 pounds of material per hour.

The distance from the intake to the discharge pipe is 12 inches on the Prizer Gypsum and Fertilizer Applicator. Thus, this machine will operate on water power alone, under conditions where a 12-inch fall in water is obtained. In areas irrigated by gravity water, it is often necessary to draw water from the ditch by connecting a small centrifugal pump to the intake pipe. This machine is especially useful in fertilizing small acreages and is readily adapted to almost any type of irrigation system.

The Prizer Pressure Type Applicator capable of introducing solutions or suspensions of dry materials into irrigation water against high pressure, by utilizing the differential pressure developed by the flow of water through a venturi tube, is a development of special interest to users of sprinkler type irrigation systems. These applicators, ranging in capacity from 50 to 600 pounds, have been successfully connected to pressure lines varying from 2 to 6 inches in diameter. A typical installation consists of a venturi tube with two main valves connected on a 5-inch line just ahead of the booster pump (Fig. 2). The flow of water from the high to the low pressure valve passes through a sealed tank with a control valve. The rate of application of the dry or liquid material in the tank can be accurately regulated by the set of the control valve. If water is shut

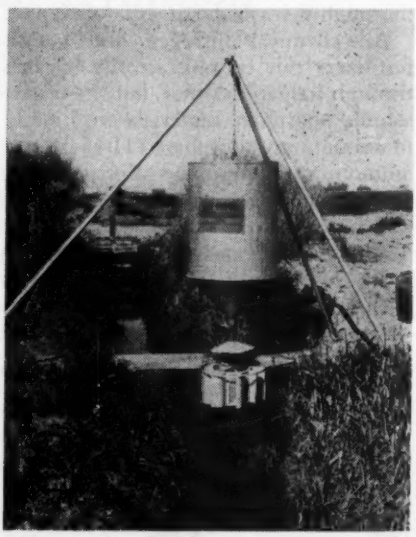


Fig. 3. Dry-Flo Fertilizer Co. Applicator set up over irrigation ditch, prior to turning on water.

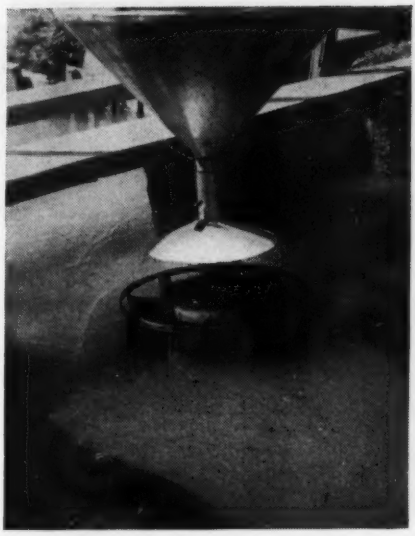


Fig. 4. Dry-Flo Applicator showing water operation of "squirrel cage" metering device.

off in the field, action stops as there is no longer a differential pressure between the high and low pressure valves of the venturi. The applicator is equipped with a translucent hose on the effluent side, making the flow of material into the line visible. It is possible to meter through this machine a large amount of fertilizer into the irrigation line in a short period. Thus, all of the fertilizer can be applied early in the irrigation period, allowing plenty of time to wash out the pipe lines and sprinklers.

Another Prizer Fertilizer applicator now used by the Dry Flo Fertilizer Company, Monrovia, California, was developed for areas irrigated by gravity water (Fig. 3). The machine is suspended over the main ditch, on a metal tripod, with the finned "squirrel cage" partially immersed in the water (Fig. 4). Fertilizer from the hopper passes through a 2-inch tube onto a plate, and as the "cage" rotates, the fertilizer is scraped into the water. The distance from the plate to the bottom of the delivery tube and the speed of the water in the ditch determine the rate of application.

Under most conditions, fertilizer is sold by the Dry Flo Company on an applied basis, although machines are also available to growers on a weekly, monthly, or acreage rental basis. The applicators are light in weight, easily set up and adjusted, will operate without the need of outside power, and serve a definite purpose in areas where frequent light applications of readily soluble fertilizers throughout the irrigation season are desired.

The Hydrator Fertilizer Side Dress Service Company, Goodyear, Arizona, also applies dry fertilizers through the irrigation water on a custom basis, at a fixed charge per acre. This company now has 25 machines operating in the Salt River Valley of Arizona and the Imperial Valley of California, and since February of 1946, more than 60,000 acres have been fertilized. A conveyor chain with a maximum of 37 buckets, each delivering approximately 50 pounds per hour, passes through the fertilizer hopper and drops the material into the mixing tank (Fig. 5). Water from the irrigation ditch is forced through the mixing tank at the rate of 50 gallons per minute by the use of a Briggs and Stratton engine and a Mallow centrif-

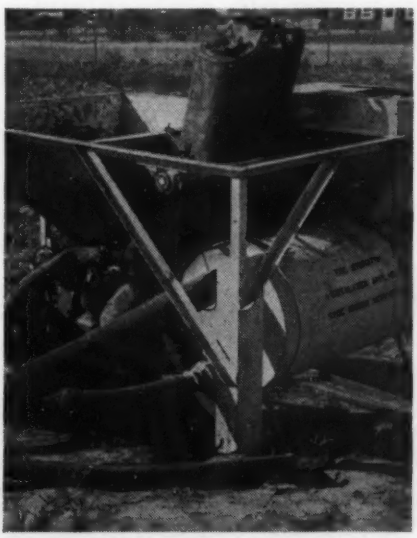


Fig. 5. View of hopper, mixing tank, suction and discharge lines of the Hydrator Fertilizer Side Dress Service Co. machine.

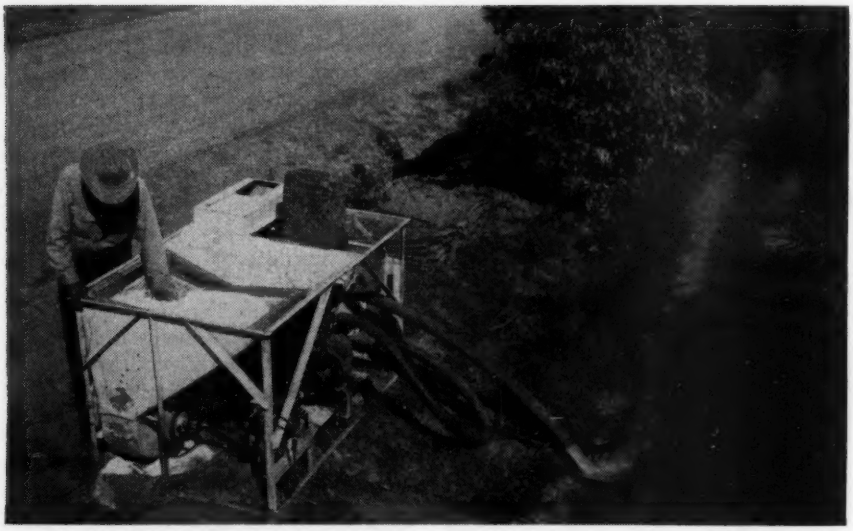


Fig. 6. General view of a Hydrator Applicator in operation.

ugal pump (Fig. 6). The buckets on the conveyor chain are removable, and the rate of application can be varied from 50 to 1,850 pounds per hour. By manually dropping fertilizer directly into the mixing tank, amounts up to 3,500 pounds per hour have been run through this machine.

Irrigation water in Kern County, California, is obtained from deep wells, and most of the gypsum applicators have been designed to fit into this type of irrigation system. The discharge line from the pump is tapped and a small pipe with control valve, connecting the line to the mixing tank on the

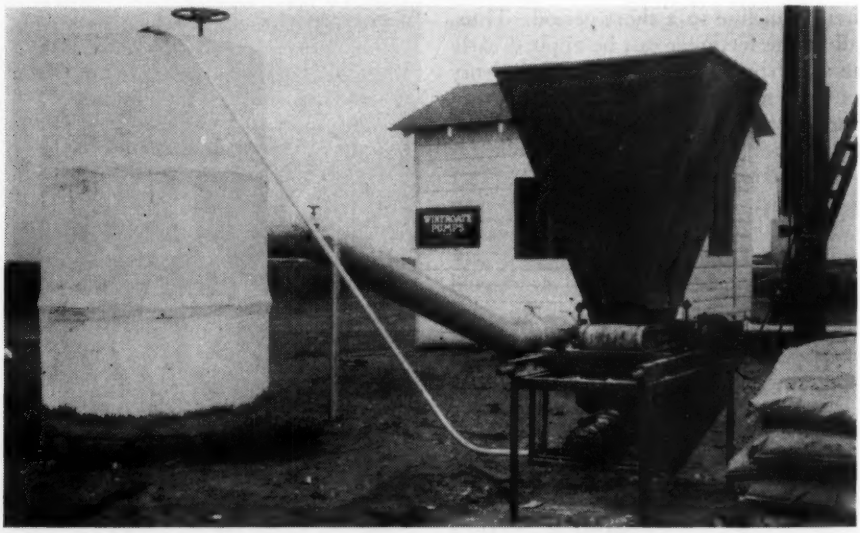


Fig. 7. Installation of E. L. Mitchell Gypsum Applicator at pump house, showing intake line and discharge line into irrigation stand pipe.

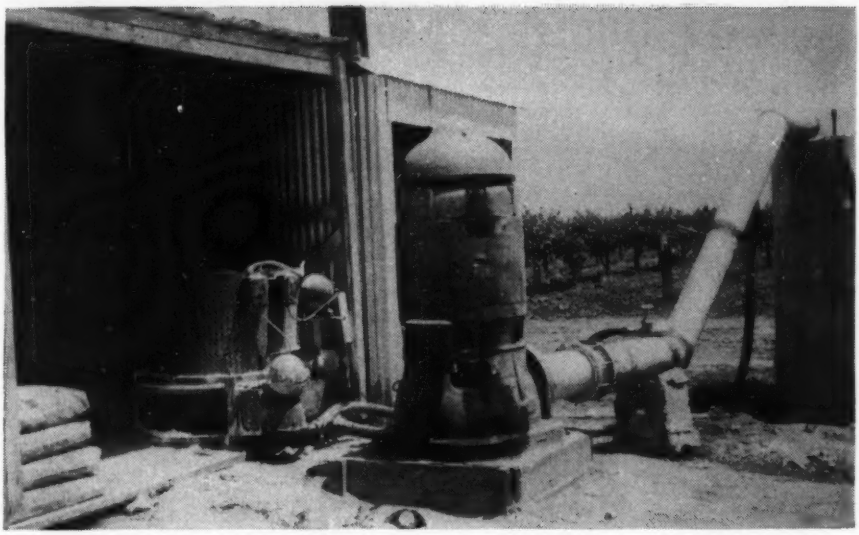


Fig. 8. Permanent installation of gypsum applicator manufactured by the Delano Engineering Co.

applicator, is installed. In most cases the gypsum suspension is pumped from the mixing tank, by means of a gas or an electric powered centrifugal pump, into high stand pipes or directly back into the irrigation line. With slight modifications, these machines can, and are, being used in areas irrigated by gravity flow water.

The E. L. Mitchell, Inc., Gypsum Applicator, manufactured at Arvin, California, consists of a hopper with nearly vertical sides to prevent "bridging" (Fig. 7). The entire load of the gypsum rests on an endless belt at the bottom of the hopper. A control gate at the discharge end of the belt may be adjusted to apply only a few pounds per hour, or as much as several hundred pounds per hour. The belt powered by a one-twelfth horse power motor and moving at a speed of 4 inches per minute, will deliver a maximum of 800 pounds of gypsum per hour. Under most conditions, it is necessary to pump the suspension from the mixing tank in to stand pipes. The most popular model has a small centrifugal pump operated by a one-third horse power electric motor attached to the discharge pipe of the mixing tank. A few machines with 1.5 H. P. air-cooled motors, that operate both the endless belt and the discharge pump, are also in use.

The Delano Engineering Company, Delano, California, is producing a stationary type of gypsum applicator (Fig. 8) and also a portable model mounted on wheels. The bottom plate of the hopper is rotated by means of a cam-operated ratchet against teeth cut on the outside of the plate. As the bottom plate rotates, the gypsum is measured into a stationary box by means of an adjustable gate, and is then carried to the mixing tank by

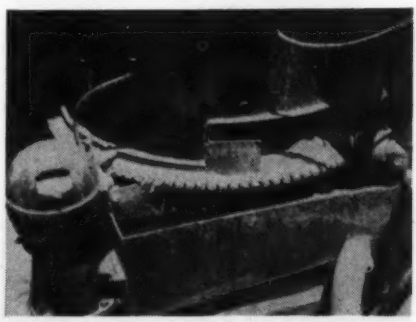


Fig. 9. Dry material being metered by means of rotating bottom plate and worm gear into mixing tank of Delano Engineering Co. machine.

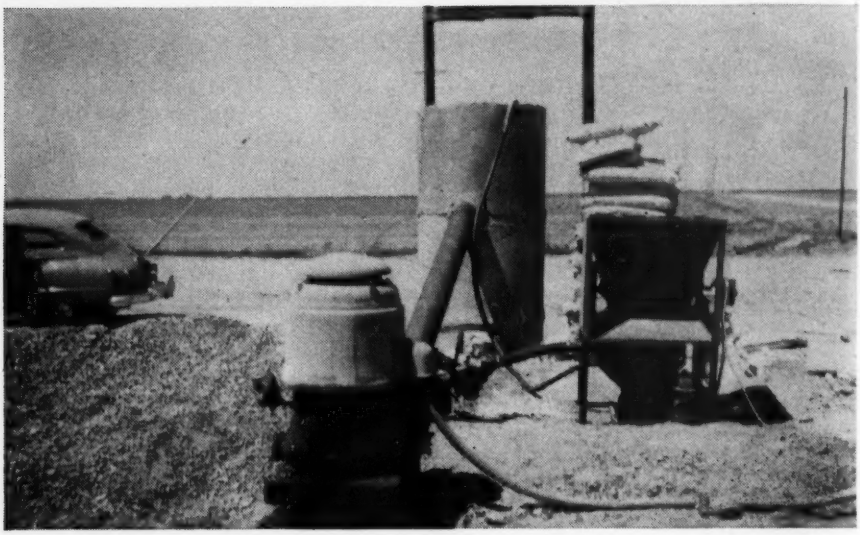


Fig. 10. Vanderlei Gypsum Applicator showing intake and discharge lines.

means of a worm gear (Fig. 9). The applicator holds 1,100 pounds of gypsum, and at a plate speed of 7 inches per minute will deliver a minimum of 5 pounds and a maximum of 1,000 pounds of gypsum per hour. The discharge pump, which does not need priming and is powered by a one-half H. P. motor, will deliver 55 gallons per minute, with a 15-foot lift. The intake from the well pump line is regulated by a valve that maintains a constant level in the mixing tank. The latest models of both the electric and the gas powered machines are direct drive operated, by means of gear reduction boxes, which eliminates the need for belts or chains.

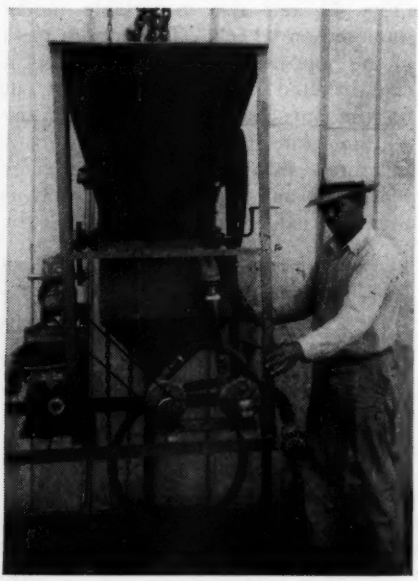


Fig. 11. Portable model of Vanderlei Applicator, showing details of construction.

Gypsum is metered into the mixing tank of the Vanderlei Gypsum Applicator, manufactured at Bakersfield, California, by the action of a worm gear directly over a series of adjustable holes in the bottom of the hopper. An agitator above the worm gear prevents "bridging." The present model delivers a maximum of 400 pounds of gypsum per hour, but this rate could be considerably increased if necessary (Fig. 10). The agitator, worm gear, and a discharge pump capable of delivering 30 gallons of water per minute with a 15-foot lift, can all be driven with a one H.P. electric motor or a 1.5 H.P. gas motor. The portable model (Fig. 11) has been equipped

(*Turn to page* 40)

Food for Thought About Food[1]

By Firman E. Bear[2]

(Conclusion)

SOILS in humid regions, as a result of long-continued leaching by heavy rainfall, tend to become hydrogen soils. The corrective is limestone, which is prepared for use either by pulverizing or by burning. The point toward which we strive in the soils of humid regions is a pH value between about 6.0 and 6.5, except for certain acid-soil plants that do best at somewhat lower levels. Some 30 million tons of liming materials are being used annually in the United States, and much larger tonnages could be applied to advantage.

In the irrigated arid areas, sodium soils tend to be dominant. The corrective for this condition is gypsum, together with the use of enough extra irrigation water to provide drainage. It has been suggested that irrigated saline soils should receive 1 ton of gypsum per acre annually and black alkali soils 2 tons, and that a 200-pound-per-acre application be made to all other irrigated soils of arid areas as a preventive measure. On this basis, some 10 million tons of gypsum might well be used annually to advantage.

A profitable agriculture requires the production of higher acre yields than are possible if one depends on Nature. The need for more nitrogen is of special interest in this connection. About 5 million tons of this element are being removed annually in the harvested crops in this country. Farmers in the Central West assume that, by plowing under an occasional crop of clover, they can replace the nitrogen they sell and that which escapes in the drainage water. They fail to realize that the remarkable increases in acre yields of corn resulting from the use of hybrid seed were obtained largely by raising the starch and lowering the protein content of the grain. Recently the need for

". . . Recently the need for more nitrogen has been re-emphasized by the phenomenal increases in corn yields that are being obtained in the South by stepping up applications of fertilizer nitrogen . . ."

[1] Presidential address, 1949 annual dinner, American Society of Agronomy, Milwaukee, Wisconsin, October 26, 1949.

[2] Research specialist in soils, Rutgers University, New Brunswick, N. J.; Past-president, American Society of Agronomy.

more nitrogen has been re-emphasized by the phenomenal increases in corn yields that are being obtained in the South by stepping up applications of fertilizer nitrogen to as much as 100 pounds of the element per acre.

There is plenty of evidence that the nitrogen content of the soils of the great corn, wheat, and cattle lands of this country is steadily decreasing. And there is equally abundant evidence that applications of fertilizer nitrogen over this entire area would work wonders in increasing crop yields. In fact, the estimated annual present need for commercial nitrogen, in terms of recognized deficiencies of the element, has been set at 1,160,000 tons by one of our governmental agencies. This is 50% more than our present consumption. But we have the techniques for getting this nitrogen out of the inexhaustible supplies in the air, and they are being ever more efficiently applied.

The plow depth of the average acre of soil contains only about 1,000 pounds of phosphorus. Deficiencies of this element are so widespread that it has become the key element in fertilizers. Fortunately about 50% of the world's known phosphate deposits are in continental United States. These contain an estimated 13 billion tons of phosphate rock. By reason of its good effects, we have been pouring superphosphate on the soil as though the deposits of phosphate rock from which it is made would last forever. Early in the century, consumption of phosphate was speeded up greatly under the slogan of higher-analysis fertilizers, merely by replacing filler with superphosphate. Now a similar movement has been started to report fertilizer constituents in terms of percentages of the element, which would give phosphorus a further boost.

Large amounts of phosphate are being wasted by excessive applications in the more intensive farming areas and by its indiscriminate use on other land that is subject to serious erosion. But large areas of our crop-land that are badly in need of phosphate have yet to receive their first application. The estimated current need for phosphorus is about 1¾ million tons of the element, which is about twice the present consumption. At the present rate of use, our phosphate reserves would last about 3,000 years. Unlike nitrogen, there is no inexhaustible supply of this element in the atmosphere.

The potassium problem is much simpler than that of either nitrogen or phosphorus. The average plowed acre contains 30,000 pounds of potassium. This is 10 times the soil's supply of nitrogen and 30 times that of its phosphorus. The potassium content of soil tends to increase with depth, whereas the nitrogen and phosphorus contents decrease. Thus the soil itself is practically an inexhaustible source of this element. Whatever difficulty plants may have in extracting as much potassium from the soil as they need, the fact remains that the element is there and something could be done toward increasing its availability in case of necessity. But, in most cases, this would be a very costly procedure.

Fortunately, there are enormous reserves of potassium in water-soluble form on which we draw. At our present rate of consumption, totaling about 800,000 tons of the element annually, the known deposits in the United States, amounting to about 1 billion tons, are enough to last about 1,250 years. Our present consumption is only about half the estimated need. But every cubic mile of ocean water contains about 1¾ million tons of potassium. If the price of potash salts should rise to about twice their present level, sea-water potash will enter the picture.

Some Soils Deficient in Minor Elements

Early in the twentieth century it became apparent that additional minor elements were required. At first these were limited to manganese and boron, but later it was shown that zinc, copper, and molybdenum also are essential to

plants, and iodine and cobalt to animals and man.

Our best example of the importance of minor elements is found in Florida. In the early days, the citrus industry was located largely in the northern part of the State. Then it was found that oranges would grow well on rough lemon stock. This allowed expansion of the industry southward on the more sandy soils, where freedom from frost was greater. About the time these new plantings came into bearing, a period of declining prices developed. This caused grove owners to switch from guano, animal tankage, and similar organic materials to the much less costly inorganic forms of nitrogen. Meanwhile, potash fertilizers had been greatly refined and bone had virtually disappeared from the market. This combination of sandy soils and inorganic fertilizers of an ever-higher degree of purity quickly began to have disastrous effects. Fortunately, our agricultural research agencies soon discovered that deficiencies of boron, copper, zinc, manganese, and magnesium were responsible for the trouble. Now these elements are regular constituents of most Florida fertilizers.

The need for minor elements is augmented with each year of increase in the agricultural age of the soil, with each step-up in acre yield, and with each move toward further purification of fertilizer salts. The supply of minor elements is limited, and economy in their use is essential. Fortunately, manures, sod crops, and cover crops serve both as sources of these elements and as agents for their solubilization in the soil. Waste is being reduced by applying the scarcest of these elements in spray form, either alone or in conjunction with insecticides and fungicides. In the event of exhaustion of the land supply of these elements, they can be obtained, in conjunction with potash salts, from the inexhaustible reserves in seawater.

The United States has experienced three serious drouths. They occurred in 1860, 1893-95, and 1930-38. During the 1893-95 drouth, about 90% of the settlers in the Great Plains area abandoned their farms. During the latest drouth, wheat production in Minnesota, Iowa, North Dakota, South Dakota, Montana, Nebraska, Kansas, Oklahoma, and Texas was cut in half and corn production was only one-third the pre-drouth average. Drouths favor grasshoppers, and the loss from these insects for the 1934-38 period was estimated at more than $315 million.

Drouths occur mainly along the edges of deserts. They are most troublesome where land masses are most extensive. Fortunately for the United States, the Gulf of Mexico and the Caribbean Sea cover what would otherwise have been a wide expanse of land. We do not have as serious drouths as Russia, China, and Australia. The Ukraine has recurring drouths about every 10 years. The Great Wall of China was built as protection against the drouth-stricken hordes from the area to the north. The vast wheat and sheep areas of Australia have suffered five serious drouths during the last century.

A great deal of exploratory work has been done on prediction of drouths.

". . . Experts predict that we shall have a very bad drouth during the early 1970's and a still worse one about . . . 2005."

Studies have been made of tree rings, silt deposits, and advances and retreats of glaciers. There is considerable evidence of a 35-year cycle, during which the climate varies from a period of cool wet years to one of warm dry years, and back again. This is known as the Brückner cycle, from its author, who predicts that we shall have a very bad drouth during the early 70's and a still worse one about the year 2005.

There are possibilities for the prevention of undue loss from drouth through the development of soil-management systems that are designed to increase the water-intake of soils. Much additional storage is being provided by contour furrows, contour listing, dam listing, lakes, and ponds. Shelterbelts slow down the wind, reduce evaporation, and hold the snow. Considerable protection is afforded to leeward of such plantings for a distance that is 20 to 30 times the height of the trees. Recently cloud seeding with dry ice has come in for a great deal of attention. But rainclouds are as scarce in humid regions in time of drouths as they usually are in the desert.

New Controls Being Developed for Diseases and Insects

Every crop is affected by one or more diseases. Some 75 diseases of wheat are known, over 100 of apples, and more than 70 of potatoes. These diseases are recognized under such names as *blights, wilts, leafspots, leaf curls, rots, scabs, russettings,* and *damping-offs.* Increasing difficulty is being experienced with viruses, about which relatively little is known.

Some disease organisms are so aggressive that they seriously reduce crop yields. Estimates for 1939 placed the loss from disease of our most important food crops at 5 to 25%. Occasionally, a disease organism gets so badly out of control as to ruin the entire crop. Notable examples are the late blight that destroyed the 1846 potato crop in Ireland, with resulting widespread famine, and the blight that eliminated the native chestnut from the United States.

In some cases, disease is controlled by crop rotation. In others, dependence is placed on selection and breeding for disease resistance. Often the most effective procedure is to use preventive sprays and dusts that kill the invading parasites before they can obtain a foothold. Some 80 million pounds of copper and 75 million pounds of sulfur are sold annually in the United States for this purpose. A wide variety of organic fungicides have recently come into use, and there are highly important possibilities for further advances in this field.

Plant diseases are being controlled ever more effectively, but they will never be eliminated. The important reason for this is that the infecting organisms reproduce so rapidly that mutations of great virulence continue to develop. Thus continuously effective control of plant diseases can be accomplished only as constant watchfulness is maintained and ever-better preventives are developed.

Insects Are Costly

The toll paid to insects in this country has been estimated at more than $1½ billion annually. The problem of their control is essentially the same as that for disease organisms. Under natural conditions, insects come to a state of dynamic equilibrium with one another, and with the other parasites that prey upon them. Various bacterial, fungus, and virus diseases serve as controls. Rain, wind, heat, and cold come to our rescue. Many of our standard agricultural practices are built around the need for insect control. Thus the corn borer is destroyed by plowing the stalks under. Clean cultivation is effective in the control of over 100 troublesome insects. Crop rotation and delayed seeding are often useful.

None of these natural controls can be depended upon to do all that must be done. As our population grows, so also does the intensity of our agriculture. The same crop is grown more fre-

quently on the land, and this permits the multiplication of the insects that affect it. Risks from insects increase and the need for their control becomes more imperative.

In the early days, the primary insecticides were the salts of the heavy metals, notably of arsenic and lead. As time went on, natural plant poisons were brought into play in such products as rotenone and pyrethrum. Later a great deal of thought went into the breeding of parasitic insects and into inoculating with disease-producing bacteria, fungi, and viruses. More recently the synthetic organic chemicals of the DDT and BHC types have come into the forefront.

Four Problems

Four problems are presented by the use of insecticides. One is the development of insects that are highly resistant to a given poison and that reproduce themselves to become extremely hardy races. A second is the accumulation in the soil of poisonous residues, both mineral and organic, to the point that they are toxic to plants. A third is the problem of poisonous spray and dust residues on plant parts that are used directly as food or feed. The fourth is the destruction of honeybees and other useful types of insects.

But rapid progress is being made in the solution of these problems. One of the most important developments is the continuous discovery and use of new organic insecticides that are highly selective for insects and have no effect whatever on man. Similarly, the newer of these materials do not accumulate in the soil, but are decomposed by soil microorganisms like any other form of organic matter.

Recently, British scientists have developed a chemical control for the tsetse fly, the carrier of sleeping sickness. This probably means that a vast waste region in Central Africa, greater than the entire land area of the United States, can now be brought into agricultural production. Similar controls for other insects hold great hope for use in our hot and humid South.

It is highly important to the welfare of this nation that every effort be made to maintain consumption of animal products at a high level. Much of our land is of little use except in livestock production. Meat, milk, and eggs have great value as protective foods, and they add much to the joy of living.

A livestock economy permits of great flexibility between the production of meat and that of grain, as conditions require. Level grazing land can be put to the plow and returned to pasture with the ebb and flow of the need for grain, as determined by war, drouth, or other national emergency. Living animals constitute highly important reserves of concentrated food that can be totally consumed in case of necessity. Finally, pasture lands have tremendous potentialities in terms of storage of soil fertility that can readily be released by cultivation.

Dairying constitutes another important type of grassland agriculture that needs to be encouraged as much as possible. Milk is one of our most important foods. We are consuming a little over one pint a person daily. Our national consumption is over 120 billion pounds annually. This is the produce of 23 million cows. Dairy cows excel all other livestock in their economy in converting roughage to human food. They yield about 18 pounds of edible

". . . One of the most important developments is the discovery of new organic insecticides that are highly selective for insects and have no effect on man."

products for each 100 pounds dry weight of feed, as compared to 15.6 pounds in pork, 5.4 pounds in eggs, and 2.8 pounds in beef.

For reasons of health, a 20% increase in milk consumption is highly desirable. On this basis, and in view of the one-third larger population for which plans are being laid, our milk requirements would be increased more than 50%. This would call for the production of over 180 billion pounds of milk and an increase in the number of cows to 36 million, at present levels of production. Milk production per cow now averages about 5,000 pounds. But the average for all cows in the dairy herd improvement associations is over 8,600 pounds. One New Jersey herd of 78 cows has averaged nearly 15,000 pounds of milk annually per cow for 16 consecutive years of official test.

Continuous increase in milk production per acre is being effected not only by growing more and better feed, but by breeding more efficient cows. Artificial insemination, by which the service of a bull of superior lineage can be increased 20 times or more, is one of the most important of the newer developments. Much effort is being put into prolonging the cow's life well beyond the present three calvings through better feed and care. Use is being made of hormones to stimulate conception, mammary development, and milk secretion. A new technique of transplanting ova is being tried, for the purpose of obtaining more daughters from the better cows.

". . . Engines for converting the sun's rays into . . . energy are in their infancy, but effective ones are not impossible."

As a result of improved methods of pasteurization and refrigeration of milk, shipment in stainless steel containers, and use of better detergents and chemical germicides, the dairy industry is gradually shifting southward, where the longer grazing period makes possible more economic production. It is believed that milk production in the United States can be raised to the desired levels without materially increasing the acreage of land devoted to the production of grain feed for dairy cows.

Grains Consumed as Such in Case of Emergency

However important meat and milk may seem to many of us, they are not essential to our existence. Nearly two-thirds of the people of the world live on diets that are made up of 80 to 90% cereals and potatoes, in comparison with an estimated 27.5% in this country. By careful use of supplemental protective foods, including fruits, vegetables, eggs, sugar, and oils, these high-cereal diets can be made to meet the recommended food allowances.

About six of every seven calories are lost from grains by feeding them first to livestock and then consuming the animals or their products. A 3,000-calorie diet becomes, in effect, a 21,000-calorie diet, when eaten in the form of meat, eggs, and milk. At present, we are consuming more than five times as many grain calories as would be required if we lived on grain alone.

In this connection, it is important to consider the potentialities of such legume seeds as soybeans and peanuts. A given area of land will produce four times as much protein if planted to soy-

(*Turn to page* 42)

Fig. 1. Close-up view of new variety of Safflower; (A) Bloom, (B) Cross section of seed head, (C) Seeds.

Better Safflower Is Here

By C. B. Sherman

Information Specialist, U. S. Department of Agriculture, Washington, D. C.

SAFFLOWER is hailed as a new oilseed crop. New varieties that yield a larger crop of seed with a higher oil content have made it new. The development of better extraction methods, the establishment of plants for processing the seed, and successful experimental work with the resulting oil, cake, and meal have strengthened the impression that we have a promising newcomer in agriculture.

Actually safflower has been grown in this country, experimentally at least, for more than 20 years. Moreover, it was a crop of antiquity for we are told that its seed was found in tombs of the Pharaohs and we know it has long been grown in North Africa and the Middle East, where crude methods of growing, harvesting, and extracting, practiced on rudimentary plants, promised little for the future.

Certified N-852, on the other hand, is a variety developed by the University of Nebraska that has an average oil content of 32 per cent, and varieties of higher yield are nearly ready for release.

In dry-land farming, yields on non-

(*Turn to page* 41)

Fig. 1. The State Soils Laboratory, created by an Act of the Wisconsin Legislature in 1912, has turned out hundreds of thousands of soil tests during the past 37 years. In 1949 over 36,000 soil samples were tested in this laboratory. Soil tests are the basis now for practically 100 per cent of the fertilizer and lime recommendations to farmers.

Extension Education in Soils in Wisconsin

By C. J. Chapman

Soils Extension Specialist, University of Wisconsin, Madison, Wisconsin

WISCONSIN'S program of extension education in soils has been an important factor in the adoption of soil-building practices by our farmers. The increased use of lime and fertilizers has made possible the tremendous increases in the yields of the new and improved varieties of hybrid corn, small grain, and other feed and food crops being grown. This program of education in soils has been carried out by means of several major activities.

Soil-testing Program

The Wisconsin program of soil testing was initiated in 1912 as the result of an Act of our Wisconsin Legislature which created the State Soils Laboratory. This law, in part, reads as follows:

"It shall be the purpose and duty of the State Soils Laboratory to make field examinations and laboratory analyses of the soil of any land in this State and to certify to the results of such examinations and analyses upon the request of the owner or the occupant of the land and the payment by him of the fee or fees hereinafter prescribed."

The services rendered under this law include a detailed examination of the farm, sampling of the various fields, the testing of these soil samples, and finally, a comprehensive report in which

a soil and crop management program is outlined based on information secured at the time of examining the farm, combined with the information gained from the soil tests. Where a group of farmers in a given community request this service, it has been customary to hold follow-up meetings, at which time the results of the tests are further explained and a general program of soil and crop management outlined to farmers who attend. The charge for this complete service for many years amounted to an average of about seven dollars per farm. In 1947 fees were doubled.

Over six thousand farms have been examined through the medium of this State Soils Laboratory during the past 37 years. This service has had a powerful influence in getting farmers started in the use of lime and fertilizers and improved cropping practices. After a farmer has his soil tested he feels that he has a very dependable guide in the use of lime and fertilizer. "Why," he'll tell his neighbors, "I've had my soil tested, and the test calls for three tons of lime on that north field, four tons on the south field, and in addition to lime these fields need an application of 300 pounds of 0-20-20 fertilizer per acre when seeded down to small grain and alfalfa."

For the most part, the recommendations in these reports have been followed religiously. The reports include a program of crop management, and usually special recommendations for the establishment of alfalfa are made. A program of pasture improvement is always outlined.

At present this individual farm-testing service has been greatly expanded and enlarged. In fact, a considerable number of counties are now set up in cooperation with the PMA which assumes the responsibility for and cost of collecting the soil samples. The farmer in turn pays 25 cents per sample for having his soils tested. Last year (1949) 54 Wisconsin counties cooperated with the PMA and availed themselves of this testing service.

In addition to this more complete farm soil survey service provided for by law, we have had for many years a free soil-testing service where farmers

Fig. 2. Agricultural lime production was given a tremendous impetus during the period 1934 to 1941, when hundreds of work relief lime-grinding and marl-digging projects were set up. Since July 1934, a total of over 19 million tons of agricultural lime has been produced and applied to Wisconsin's acid soils.

have sent in hundreds of thousands of samples of soil which were tested for acidity, available phosphorus, and available potassium. In 1938 a State-wide WPA soil-testing project was set up and some 55 county laboratories were established. This WPA program was carried out over a period of four years. Later, some of these county laboratories were merged into district laboratories, while others are still functioning under the direct supervision of county agents.

In 1947 it was decided to charge 25 cents per sample for all samples of soil tested in our State Soils Laboratory. We felt that soil testing had passed the stage where we could justify the cost of it simply as a part of our educational program. The volume of soil samples coming into our laboratory was increasing every year by the thousands. Furthermore, we felt that this small charge would hold down the number of samples farmers and others might send in and especially it would cut down the number of the "flower pot" type of sample. Too, we felt that if farmers paid a small fee for this testing service, they would be more likely to follow through on the recommendations made as to lime and fertilizer treatments based on the tests.

In 1949 we tested 36,363 samples of soil in our State Soils Laboratory, with some 50 county laboratories testing better than 250,000 samples.

Some rather interesting information is coming out of all of this work. We are finding, for instance, that the increased use of lime has cut down the percentage of soil showing a strong degree of acidity (pH 4.8 to 5.2) and, of course, the percentage of soil samples actually showing acidity is on the decrease. Most certainly the 19 million tons of lime which have been spread on Wisconsin farms during the past 15 years have reduced the acidity of our soils. Lime is usually recommended on fields where the pH drops under 6.5. The average for the 36,363 samples tested in 1949 showed that about 52 per cent were acid and in need of lime, whereas 15 years ago better than 85 per cent of all samples tested in our laboratory were acid. Included, of course, in this 52 per cent of acid soil

Fig. 3. Result demonstration meeting held in the field gives farmers who attend opportunity to see as well as hear. This picture of a "Plow-sole Fertilizer Demonstration" on corn was taken on Earl Olson's farm, Spring Green, Wis., in 1949. Yields: 150# of 3-12-12 in hill = 48.5 bu. per acre; 150# of 3-12-12 in hill plus 800# of 8-8-8 plow-sole = 104.6 bu. per acre.

Fig. 4. The thousands of demonstrations carried out over the past 25 years on small grain and seedings of clover and alfalfa have had a powerful influence in selling farmers as well as county agents and other educational leaders on the use of fertilizers. Here, on Clair Bennett's farm, Endeavor, Wis., is the amazing response of Clinton oats to treatment with fertilizer. Yields: No fertilizer = 39.5 bu. per acre; 500# of 0-20-20 plus 100# ammonium nitrate = 79.8 bu. per acre.

samples were hundreds of samples representing thousands and thousands of acres which had been limed once and where the acidity had been reduced from strong to medium or slight degree.

The application of the millions of tons of lime in the past 15 years has further tended to loosen up phosphorus in our soils, and this factor combined with the cumulative effect of the repeated application of fertilizer rich in phosphate has cut down the percentage of samples showing a deficiency in this element. In averaging the results of tests for available phosphorus on the 36,363 samples tested in 1949, we found that 63 per cent were deficient in available phosphorus. Fifteen years ago over 80 per cent of the soils tested in Wisconsin were low in available phosphorus.

But the story for potash is just the opposite. In 1949, 93 per cent of all samples tested dropped under the optimum level for available potassium, whereas 15 years ago only 55 per cent of all samples tested in the State were low in available potassium.

Work Relief Lime Production Program

The Work Relief Lime-grinding and Marl-digging Project started in 1934 as a part of the FERA Work Relief Program and later set up as a work project under WPA gave tremendous impetus to the production and use of agricultural lime in Wisconsin. This program of lime production, sponsored by the Extension Service of the College of Agriculture, has made possible the doubling and the trebling of our acreage of alfalfa. And not only has there been this great increase in the acreage and production of alfalfa, but clover on Wisconsin farms has become a more dependable crop. In the wake of a larger acreage of legumes and the consequent fixation of more nitrogen, have come increases in the yields of corn, small grain, and other crops.

A law enacted in 1935 legalized the production of agricultural lime by county boards. During the period from July 1934 and for eight years following, WPA lime production projects

(*Turn to page* 46)

Can We Afford Enough Fertilizer to Insure Maximum Yields?

By L. G. Zinn

Instructor, Institutional-on-Farm Training, Phillipi, West Virginia

AFTER writing the above title, I have decided that it is stated wrong and that it should have been, "Can we afford not to use enough fertilizer to insure the maximum yields?" And I believe that I can prove that we cannot.

Our old idea has been not to feed the crop with an application of plant food sufficient to insure a good yield. It has been more like the doctor that gives his patient a shot in the arm as a stimulant to enable him to recover enough to take more nourishment. But the trouble with us as farmers is that we have forgotten to provide that nourishment after the first shot. Rather, we have left the patient to shift for himself with very poor pickings, when we realize that we have been taking the plant food from the soil for 100 years or more and in many cases returning none.

Ever since I have been farming I have always felt that we should put back into the soil in some way as much actual plant food as we expected the crop to take out. There is just so much in our soils, and no magic that I know of will enable the soils to manufacture more from nothing.

I had never had the chance to test out this belief until we began high-yield tests in our class of Veteran Farm Trainees, and I am convinced now that the two past years have proved my theory. The first year I thought that it might have been mere chance that five farmers in different parts of the county under five different types of soil and different methods of planting could produce over 100 bushels of shelled corn per acre in a county that had an average of around 40 bushels. But this year when eight men did the same thing in a year that was not a good corn year I was convinced that it was not "chance."

I know that the experiment stations and few farmers have reached these and even higher yields. However, if you read the accounts of their plots, everything was in their favor. With our men it was different. They planted their corn on all kinds of land, steep and level, high-producing, and on land that did not produce enough wild hay to see where you went when mowing. There also was sandy to clay soil, some of which did not have a topsoil of over four inches.

Could they afford to apply enough plant food to produce this yield? We have been told by a lot of folks that they could not afford it and even a fertilizer expert had his doubts. But the saying that figures don't lie still holds good, and here are the figures to prove that they cannot afford *not* to use enough if they are to stay in the farming game. (See Table).

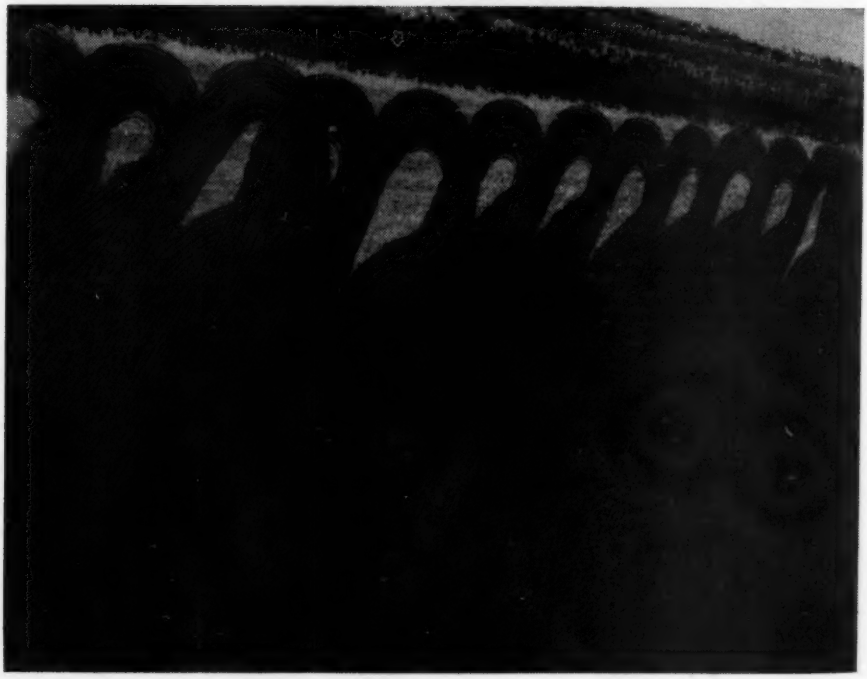
Now let's look at these figures. This is shelled corn, and the price was figured on what corn was selling for at the time of harvest. We have not allowed anything for the rent of the land nor taxes and other incidental expenses that go along with farming. However, suppose we say that Beryl Hardin would allow $44 for all those things which I am sure would more than cover the cost. Then that leaves him $100 labor income on an acre of corn. Beryl had the best chance for

(*Turn to page* 44)

PICTORIAL

Getting Ready For Easter!

Spring Patterns on the Prairie



Recess Time from Spring Work

Farm Youngsters

The Editors Talk

Greener Pastures in 1950

The grass on the other side of many fences is going to look a lot greener this year if the interest in celebrating 1950 as pasture year continues to spread as rapidly as it has to date. Not only the agricultural press but State officials and leaders of groups throughout the country are endorsing a plan to stress the importance of more and better pastures in the Nation's agriculture. Governor Elbert N. Carvel of Delaware, after issuing a proclamation making 1950 Pasture Year in that State, wrote to the 47 other governors urging them to do likewise.

What can be and is being accomplished by a movement of this kind has been proved by the New England Green Pasture Contest now in its third year. Such outstanding results have been obtained and so much publicity given the contest that a green pasture program is being inaugurated in several other States, including North Carolina, Kentucky, Alabama, Mississippi, Wisconsin, Virginia, and Washington.

In Kentucky, long famous for her fine pastures, the objectives of the program are listed as follows:

1. To establish high-producing grasses and legumes on all land adapted to pasture production.
2. To encourage the more widespread use of cover crops for grazing.
3. To demonstrate how to secure maximum financial returns from pastures.
   a. By having pastures of high quality through all seasons.
   b. By providing sufficient soil nutrients and proper soil conditions for high pasture production.
   c. By full utilization of grasses and legumes in crop rotations.
   d. By employing appropriate mechanical practices.
   e. By effective utilization with livestock.
4. To recognize outstanding progress of individual farmers, and to use their achievements as demonstrations of what can be accomplished.

In carrying out the purposes of the program, awards will be given to farmers for outstanding achievements; recognition to 4-H, F.F.A., and G.I. enrollees; recognition to the county achieving the best program in the State. There will be district livestock-pasture meetings and some sort of recognition will be available to all persons participating in the program. Definite rules for eligibility and procedure for those competing for awards have been drawn up.

Undoubtedly similar set-ups will be adopted in other States inaugurating a pasture program on a State-wide basis. This is all highly commendable and should prove a most valuable means of disseminating the information available for pasture improvement. But in the absence of such stimulus, it behooves every livestock farmer to become interested in his own green pasture program, if he wishes to cut his costs of milk and meat production. Many farms do not have

enough pasture. On others, there is too much and these old pastures have been grazed for years with no replacement of the mineral plant foods except in the scattered droppings. Such rundown pastures cannot produce the high-protein forage which is such a big factor in livestock profits.

A pertinent point in this connection was noted in the New England Dairyman, December 1949 issue: "New England's Green Pasture Program will, in 1950, become a year-around program; in other words, production of quality roughage for winter as well as abundant feed from early spring until late fall. This announcement comes from Louis A. Zehner of the Federal Reserve Bank, Chairman of the New England Green Pastures Committee."

A Record in Records

Despite all the good advice and urging, too many farmers are still neglecting the keeping of accurate records. This fact undoubtedly is brought home to them, as to a great many of the rest of us who are not actual farm producers, come income tax time. But like the rest of us, once the "headache" is over, they get back into the habit of "remembering it later."

It was heartening, therefore, to note in the U.S.D.A. Farm Paper Letter issued weekly by E. R. McIntyre of the Press Service, U. S. Department of Agriculture, what may well be a record in records. To quote the item in full:

"Here's a treasured letter received lately from Everett Martin, to whom the farm paper I edited in Wisconsin presented a Master Farmer degree back in 1929 when Mr. Martin was only 70 years young. Now at 90 years he takes his pen in hand, and a firm one too:

" 'It is with great pleasure that I learn that you have not forgotten me. Among my possessions the one most highly prized is the medal you saw fit to bestow on me. The Master Farmers of southern Wisconsin came on my 90th birthday to help me celebrate—a great surprise as I knew nothing of their intentions until they came.

" 'I have not for a moment regretted choosing agriculture for my life work. I can look back a greater distance than the majority of mankind; and can see I have made mistakes, but did the best I knew with the light I had at the time. I have tried to set an example that, if others followed it, they would not disgrace themselves at least.

" 'I feel that I am close to the end of the row. I felt badly when I found that I had to take a stand at one side and let the hired help and my son take the lead. I have given over the management of my farm to my son. I think he will continue along the lines that I have laid down. I sometimes think he might have had a better teacher.

" 'My grandson (he is now 15) seems to look with respect on the dairy cow. So I will leave this earth quite satisfied. Sometimes I am a little proud of my milk records. On January 1, 1950, it will be 53 years that I have weighed each cow's milk separately and have the records of the same on file. I am told there is not another farm in the United States that can show this equal in dairy records. I close with kind regards for your happiness and prosperity.' Everett Martin, Mukwonago, Wisconsin."

Just how much this accurate and detailed record-keeping has contributed to Mr. Martin's long and satisfying span of farming activity is a matter of speculation. It is a safe gamble, however, that it was one of the keynotes of his success and we do not blame him for taking pride in it.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay[1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	31.0	38.7	153.0	219.0	136.0	205.0	19.00	67.80	....
1949									
March.....	28.74	31.9	174.0	254.0	118.0	198.0	20.00	51.40	....
April.....	29.91	24.7	181.0	275.0	122.0	200.0	19.00	50.30	....
May.....	29.97	32.5	181.0	273.0	122.0	200.0	17.70	50.40	....
June.....	30.13	31.5	175.0	264.0	121.0	186.0	16.40	46.70	....
July.....	30.08	56.5	155.0	283.0	125.0	182.0	15.65	37.50	....
August.....	29.32	44.6	154.0	267.0	118.0	179.0	16.05	44.40	....
September...	29.70	48.7	138.0	230.0	116.0	187.0	16.25	43.50	....
October.....	28.70	47.4	130.0	196.0	109.0	189.0	16.75	41.80	....
November...	27.76	43.4	134.0	189.0	102.0	190.0	16.75	42.30	....
December....	26.50	45.4	131.0	202.0	113.0	193.0	17.15	43.30	....
1950									
January.....	26.47	39.7	136.0	215.0	115.0	192.0	17.15	43.60	.. .
February....	27.50	34.1	133.0	221.0	116.0	193.0	16.75	43.60	....

Index Numbers (Aug. 1909—July 1914 = 100)

1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	89	81	109	74	87	110
1938.....	69	196	80	79	76	64	57	97	88
1939.....	73	154	100	84	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	105	117	107	82	211	129
1942.....	153	369	168	134	143	124	91	202	163
1943.....	160	405	188	235	174	154	125	231	245
1944.....	167	420	214	216	170	160	139	234	212
1945.....	181	366	205	232	198	170	127	227	224
1946.....	263	382	178	248	212	209	141	319	204
1947.....	257	380	232	248	336	259	148	381	249
1948.....	250	387	220	249	212	232	160	301	238
1949									
March.....	232	319	250	290	184	224	168	228	263
April.....	241	247	260	314	190	226	160	223	236
May.....	242	325	260	312	190	226	149	224	213
June.....	243	315	251	301	188	210	138	207	175
July.....	243	565	222	323	195	206	132	166	185
August.....	236	446	221	305	184	202	135	197	174
September...	240	487	198	263	181	212	137	193	205
October.....	231	474	187	224	170	214	141	185	170
November...	224	434	192	216	159	215	141	188	213
December....	214	454	188	230	176	218	144	192	196
1950									
January.....	213	397	195	245	179	217	144	193	261
February....	222	341	191	252	181	218	141	193	203

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	10.11	10.59	10.84	9.85
1949						
March	3.19	2.27	9.27	12.36	9.64	9.71
April	3.19	2.27	9.22	12.36	9.71	9.87
May	3.19	2.27	9.43	12.36	9.71	9.11
June	3.19	2.28	9.65	13.34	10.02	9.71
July	3.19	2.32	11.07	14.97	11.53	10.78
August	3.19	2.32	11.88	14.49	12.75	12.14
September	3.19	2.32	9.83	14.53	11.53	11.53
October	3.08	2.32	9.94	14.58	11.29	11.65
November	3.00	2.32	10.39	14.21	10.39	10.78
December	3.00	2.32	12.94	13.88	9.87	9.94
1950						
January	3.00	2.32	10.27	13.79	10.26	10.08
February	3.00	2.32	9.37	13.45	8.96	8.96
Index Numbers (1910-14 = 100)						
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949						
March	119	80	265	350	286	276
April	119	80	263	350	288	280
May	119	80	269	350	288	259
June	119	80	276	378	297	276
July	119	81	316	424	342	306
August	119	81	339	410	378	345
September	119	81	281	412	342	328
October	115	81	284	413	335	331
November	112	81	297	403	308	306
December	112	81	311	393	293	282
1950						
January	112	81	293	391	304	288
February	112	81	268	381	266	255

Wholesale Prices of Phosphates and Potash * *

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2]
1910-14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1925	.600	2.44	6.16	.584	.860	23.72	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.498	.706	18.93	.195
1948	.764	4.27	6.60	.478	.681	14.14	.195
1949							
March	.770	3.85	7.06	.375	.720	14.50	.200
April	.770	3.85	7.06	.375	.720	14.50	.200
May	.770	3.85	7.06	.375	.720	14.50	.200
June	.770	3.66	7.06	.330	.634	12.76	.176
July	.770	3.60	5.87	.353	.679	13.63	.188
August	.770	3.60	5.47	.353	.679	13.63	.188
September	.770	3.65	5.47	.353	.679	13.63	.188
October	.770	3.75	5.47	.375	.720	14.50	.200
November	.770	3.76	5.47	.375	.720	14.50	.200
December	.770	3.76	5.47	.375	.720	14.50	.200
1950							
January	.762	3.76	5.47	.375	.720	14.50	.200
February	.760	3.76	5.47	.375	.720	14.50	.200
Index Numbers (1910-14 = 100)							
1925	110	68	126	82	90	98	74
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949							
March	144	107	145	68	76	60	83
April	144	107	145	68	76	60	83
May	144	107	145	68	76	60	83
June	144	101	145	62	67	53	80
July	144	100	120	65	71	56	82
August	144	100	112	65	71	56	82
September	144	101	112	65	71	56	82
October	144	104	112	68	76	60	83
November	144	104	112	68	76	60	83
December	144	104	112	68	76	60	83
1950							
January	142	104	112	68	76	60	83
February	142	104	112	68	76	60	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1925.....	156	153	151	112	100	131	109	80
1926.....	146	150	146	119	94	135	112	86
1927.....	141	148	139	116	89	150	100	94
1928.....	149	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	123	130	127	86	56	130	102	77
1942.....	158	149	144	93	57	161	112	77
1943.....	192	165	151	94	57	160	117	77
1944.....	196	174	152	96	57	174	120	76
1945.....	206	180	154	97	57	175	121	76
1946.....	234	197	177	107	62	240	125	75
1947.....	275	231	222	130	74	362	139	72
1948.....	285	250	241	134	89	314	143	70
1949								
March....	258	245	231	134	99	290	144	72
April.....	256	244	229	134	99	291	144	72
May.....	253	244	227	134	99	293	144	72
June.....	249	242	223	134	99	304	144	65
July.....	246	240	225	140	100	349	144	68
August....	244	238	222	143	100	372	144	68
September.	247	238	225	138	100	334	144	68
October...	242	237	222	138	98	331	144	72
November.	237	236	221	136	96	321	144	72
December..	233	237	221	136	96	317	144	72
1950								
January...	235	238	221	135	96	316	142	72
February..	237	237	223	132	93	233	142	72

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizer Analyses and Registrations, 1949," State Dept. of Agr., St. Paul Minn., H. A. Halvorson.

"County Fertilizer Data, January 1 through June 30, 1949," Ofc. State Chem., Texas Agr. Exp. Sta., College Station, Texas.

"Fertilizers For 1950," c/o CNR Agr. Dept., Maritime Fertilizer Council, Moncton, N. B., Canada, J. E. McIntyre.

"The Fertilizer Trade, July 1, 1948–June 30, 1949," Dept. of Trade & Comm., Dom. Bur. of Stat., Ottawa, Ont., Canada, C. D. Howe.

"The Fertilizer Manufacturing Industry, 1948," Dom. Bur. of Stat., Ind. & Mdsg. Div., Ottawa, Ont., Canada, Ann. Ind. Rpt. No. A50–50, C. D. Howe.

Soils

"Livingston County Soils," Agr. Exp. Sta., Univ. of Ill., Soil Rpt. 72, Urbana, Ill., Aug., 1949, H. L. Wascher, R. S. Smith, and R. T. Odell.

"Farm Ponds, September, 1949," Cornell Univ., Ithaca, N. Y., Ext. Bul. 771, A. D. Pistilli.

"Physical and Chemical Characteristics of Slick-Spot Soils, September, 1949," Okla. Agr. Exp. Sta., Okla. A & M College, Stillwater, Okla., Manus. Rpt. Abstract No. 1, W. L. Blizzard and L. E. Hawkins.

"Liming Western Oregon Soils, September 1949," Agr. Exp. Sta., Oreg. State College, Corvallis, Ore., Sta. Cir. 180, Sept. 1949, R. E. Stephenson and W. L. Powers.

"Report of the Chief of The Soil Conservation Service, 1949," SCS, USDA, H. H. Bennett.

"Use The Land And Save The Soil," SCS, USDA, PA-71, Sept. 1949, R. H. Musser.

Crops

"Arizona Agriculture 1950," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 226, Jan. 1950, G. W. Barr.

"Arizona Home Gardening," Agr. Ext. Serv., Univ. of Ariz., Tucson, Ariz., Ext. Cir. 130, H. F. Tate.

"Breeding and Testing Strawberry Varieties," Calif. Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Bul. 714, Oct. 1949, R. E. Baker and Victor Voth.

"Sweet Corn Trials, Mt. Carmel and Windsor, Connecticut, 1949," Conn. Agr. Exp. Sta., New Haven, Conn., Prog. Rpt. 49G1, W. C. Galinat.

"Thirteenth Biennial Report of the Department of Agriculture, State of Florida, from July 1, 1946 to June 30, 1948," Dept. of Agr., Tallahassee, Fla., Nathan Mayo.

"Corn Performance Tests, 1949," Ga. Exp. Sta., Experiment, Ga., Cir. 163, Jan. 1950, G. A. Lebedeff, O. L. Brooks, and M. B. Parker.

"How to Grow Tobacco Plants," Ga. Agr. Ext. Serv., Athens, Ga., Cir. 302, Rev. June 1949, E. C. Westbrook.

"Growing Lima Beans," Ga. Exp. Sta., Univ. System of Ga., Experiment, Ga., Press Bul. 618, Jan. 16, 1950, B. O. Fry.

"The Callaway and Coastal Blueberries," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Mimeo. Paper No. 67, Jan. 1950.

"Kansas Corn Tests, 1948," Agr. Exp. Sta., Dept. of Agron., Kansas State College, Manhattan, Kans., Bul. 340, Feb. 1949, A. L. Clapp and L. A. Tatum.

"Vegetable Planting Guide for Louisiana," Div. of Agr. Ext., La. State Univ., Baton Rouge, La., Ext. Pub. 1019, (Formerly Leaflet No. 22, Rev. March, 1949), Oct. 1949, J. A. Cox, Joseph Montelaro, A. C. Moreau, and D. H. Spurlock.

"Louisiana Dallis Grass," La. State Univ., Baton Rouge, La., Ext. Pamph. 1001, July 1949, R. A. Wasson and W. E. Monroe.

"Research For Maine Farmers, Sixty-Fifth Annual Report of Progress, Year Ending June 30, 1949," Agr. Exp. Sta., Univ. of Maine, Orono, Maine, Bul. 473, June 1949, Fred Griffee.

"Green Manure Crops and Rotations for Maine Potato Soils," Agr. Exp. Sta., Univ. of Maine, Orono, Maine, Bul. 474, July, 1949, G. L. Terman.

"Varieties of Vegetables Recommended for Maryland in 1950," Hort. Mimeo. 38, Feb. 1950, E. K. Bender.

"The Nutritional Status of Maryland Orchards In Terms of Mineral Content of Leaves

and Occurrence of Deficiency Symptoms," Agr. Exp. Sta., Dept. of Hort., Univ. of Md., College Park, Md., Sci. Publ. No. A234, A. L. Schrader, L. E. Scott, and C. O. Dunbar.

"Annual Report For the Fiscal Year Ending June 30, 1949, Massachusetts Agricultural Experiment Station," Bul. No. 453, Aug. 1949, Univ. of Mass., Amherst, Mass.

"Fruit Varieties for Northern Michigan Areas Where Hardiness is a Factor," Mich. State College, Coop. Ext. Serv., East Lansing, Mich., Ext. Folder F-128, April 1949.

"Pollination and Fruit Set of Orchard Fruits," Mich. State College, Coop. Ext. Serv., East Lansing, Mich., Ext. Folder F-129, April 1949.

"Top Working Fruit Trees," Mich. State College, Coop. Ext. Serv., East Lansing, Mich., Ext. Folder F-131, April, 1949.

"Tips on Asparagus Growing," Mich. State College, Ext. Serv., East Lansing, Mich., Ext. Folder F-132, April 1949.

"Blackberries and Dewberries," Mich. State College, Coop. Ext. Serv., East Lansing, Mich., Ext. Folder F-133, April, 1949.

"Dwarf Fruit Trees," Mich. State College, Coop. Ext. Serv., East Lansing, Mich., Ext. Folder F-136, June 1949.

"Production Costs on Selected Dryland Grain Farms," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Mimeo. Cir. 52, Sept. 1949, R. E. Huffman.

"62nd Annual Report," Agr. Exp. Sta., Univ. of Neb., College of Agr., Lincoln, Neb., May 1949, W. V. Lambert and M. L. Baker.

"Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1948," Agr. Exp. Sta., Univ. of Nev., Reno, Nev., 1949, Jack McCarthy.

"Field Crop Recommendations 1950," Ext. Serv., Rutgers Univ., New Brunswick, N. J., Leaf. 37, Nov. 1949, J. E. Baylor and R. A. Briggs.

"Growing Geraniums as House Plants," N. J. Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 530, Sept. 1949, H. M. Biekart.

"Making a New Lawn," N. J. Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Cir. 531, Oct. 1949, R. E. Engel and G. L. Ahlgren.

"Sixty-First Annual Report of the College of Agriculture at Cornell University and of The Cornell University Agricultural Experiment Station, 1948," Cornell Univ., Ithaca, N. Y., E. E. Day, A. W. Bigson, W. I. Myers, L. R. Simons, C. E. F. Gutterman, and Catherine Personius.

"The Planting and Care of Shrubs and Trees," Cornell Univ., Ithaca, N. Y., Ext. Bul. 185, Sept. 1929 (Rptd. Sept. 1949), D. J. Bushey.

"Hybrid Corn Field Trials, 1949," Agr. Exp. Sta. and Ext. Serv. Coop., N. D. Agr. College, Fargo, N. D., Mimeo. Cir. 82, Jan. 1950, Wm. Wiidakas, R. B. Widdifield and L. W. Briggle.

"Cotton Varieties for Oklahoma," Okla. Agr. Exp. Sta., Okla. A & M College, Stillwater, Bul. No. B-343, Jan. 1950, I. M. Parrott, N. M. Gober, Jr., and J. M. Green.

"Sprinkler Irrigation Costs for Vegetable Crops in the Willamette Valley, Oregon," Agr. Exp. Sta., Ore. Sta. College, Corvallis, Oreg., Sta. Bul. 463, June 1949, M. H. Becker and D. C. Mumford.

"Cost of Producing Sweet Corn in the Willamette Valley, Oregon," Agr. Exp. Sta., Ore. State College, Corvallis, Ore., Sta. Bul. 465, Aug. 1949, G. B. Davis and D. C. Mumford.

"Cost of Producing Table Beets in the Willamette Valley, Oregon," Agr. Exp. Sta., Ore. State College, Corvallis, Oreg., Sta. Bul. 465, Aug. 1949, G. B. Davis and D. C. Mumford.

"Cost of Producing Carrots in the Willamette Valley, Oregon," Agr. Exp. Sta., Ore. State College, Corvallis, Oreg., Sta. Bul. 467, Aug. 1949, G. B. Davis and D. C. Mumford.

"Quality Loss in Marketing Oregon Early-Crop Potatoes," Agr. Exp. Sta., Ore. State College, Corvallis, Oreg., Sta. Bul. 468, Oct. 1949, G. B. Davis.

"Cost of Producing Strawberries for Processing in the Willamette Valley, Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 469, Oct. 1949, G. W. Kuhlman and D. C. Mumford.

"Boysenberries and Loganberries for Processing in the Willamette Valley, Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 470, Nov. 1949, G. W. Kuhlman and D. C. Mumford.

"Cost of Producing Red Raspberries for Processing in the Willamette Valley, Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 472, Dec. 1949, G. W. Kuhlman and D. C. Mumford.

"Cost of Producing Black Raspberries for Processing in the Willamette Valley, Oregon," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Bul. 473, Dec. 1949, G. W. Kuhlman and D. C. Mumford.

"Cost of Producing Perennial (English) Rye Grass Seed, Willamette Valley, Oregon, 1948," Agr. Exp. Sta., Oreg. Sta. College, Corvallis, Oreg., Sta. Info. Cir. No. 461, Aug. 1949, E. A. Hyer, M. H. Becker and D. C. Mumford.

"Cost of Producing Alta Fescue Grass Seed, Willamette Valley, Oregon, 1948," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Info. Cir. No. 462, Aug. 1949, E. A. Hyer, M. H. Becker, and D. C. Mumford.

"Cost of Producing Chewings Fescue Grass Seed, Willamette Valley, Oregon, 1948," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Info. Cir. No. 463, Aug. 1949, E. A. Hyer, M. H. Becker and D. C. Mumford.

"Cost of Producing Highland Bentgrass Seed, Willamette Valley, Oregon, 1948," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Info. Cir. No. 464, Aug. 1949, E. A. Hyer, M. H. Becker and D. C. Mumford.

"Comparison of the Cost of Producing Various Grass Seeds by Soil Classes, Willamette Valley, Oregon, 1948," Agr. Exp. Sta., Oreg.

State College, Corvallis, Oreg., Sta. Info. Cir. No. 465, Aug. 1949, E. A. Hyer, M. H. Becker and D. C. Mumford.

"Cost of Producing Italian (Common) Rye Grass Seed, Willamette Valley, Oregon, 1948," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Info. Cir. No. 466, Aug. 1949, E. A. Hyer, M. H. Becker and D. C. Mumford.

"Harvesting Pasture and Forage Crops with Turkeys," Agr. Exp. Sta., Oreg. State College, Corvallis, Oreg., Sta. Info. Cir. No. 467, Sept. 1949, D. H. Sherwood, C. A. Larson and J. A. Harper.

"Science for the Farmer," Agr. Exp. Sta., Pa. Sta. College, School of Agr., Supplmt. 1 to Bul. 515 (62nd Annual Rept.), Jan. 1950.

"Patterns of Fruit and Vegetable Production in Pennsylvania," Agr. Exp. Sta., Pa. State College, School of Agr., State College, Pa., Bul. 520, Jan. 1950, W. T. Butz and W. A. Lee.

"Buttonclover (Medicago Orbicularis)," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. No. 104, Sept. 1949, J. A. Ewing.

"Cotton Varieties and Related Studies 1936 through 1948," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Bul. No. 211, June 1949, N. I. Hancock.

"Grazing Studies On the Amarillo Conservation Experiment Station 1943-49," Texas A. & M. College System, Bul. 717, Dec. 1949, C. J. Whitfield, J. H. Jones and J. P. Baker.

"Results of the 1948 Cotton Defoliation Tests at Lubbock," Texas Agr. Exp. Sta., Texas A & M. College, College Station, Texas, PR 1182, Aug. 26, 1949, E. L. Thaxton, Jr. and D. L. Jones.

"Trees and Shrubs at the Big Spring Field Station," Texas Agr. Exp. Sta., Texas A & M College System, College Station, Texas, PR 1185, Aug. 30, 1949, F. E. Keating.

"Fruits For Home Planting At The Big Spring Field Station," Texas Agr. Exp. Sta., Texas A & M College System, College Station, Texas, PR 1186, Aug. 31, 1949, F. E. Keating.

"Cabbage Variety Trials In The Lower Rio Grande Valley of Texas," Texas Agr. Exp. Sta., Texas A & M College System, College Station, Texas, PR 1187, August 31, 1949, J. S. Morris and G. R. Williams, N. P. Maxwell, C. C. Edwards, R. Cintron and W. R. Cowley.

"Efficiency Studies of Utah Dairy Pastures," Ext. Serv., Utah State Agr. College, Logan, Utah, Ext. Bul. 188, L. H. Rich, A. F. Bracken, Wm. H. Bennett and G. T. Baird.

"Recommendations for Range Seeding in Utah," Utah State Agr. College, Logan, Utah, Ext. Bul. 193, L. A. Stoddart, Wayne Cook, H. J. Burbank, Joseph Libbie, George Stewart and R. L. Wrigley.

"Report of the Chief of the Office of Experiment Stations, Agricultural Research Administration, 1949," USDA, Wash., D. C., 860449—49, R. W. Trullinger.

"Growing Grapes for Home Use in Eastern Canada," Exp. Farm Serv., Div. of Hort., Dept. of Agr., Ottawa, Ont., Canada, Pub. 564, (Rev.) Cir. 147, Dec. 1949, F. S. Browne.

"Report of the Minister of Agriculture for the Dominion of Canada for the Year Ended March 31, 1949," J. G. Gardiner.

"Dominion Experimental Station, Lacombe, Alberta, Progress Report 1937-1946," Dept. of Agr. Exp. Farms Serv., Canada, G. E. Delong.

Economics

"Connecticut Vegetable Acreages, 1947–1948–1949," Dept. of Farms & Mkts., State Ofc. Bldg., Hartford, Conn., Bul. No. 107, 1949, Comm. John Christensen.

"Looking Ahead with Delaware Farmers and Homemakers," Ext. Serv., Univ. of Del., Newark, Del., Ext. Folder No. 17, Jan. 1950, Miss Louise R. Whitcomb and W. T. McAllister.

"Thirteenth Annual Report, Area 2, Farm Record Summary, 1948," Agr. Ext. Serv., Farm Mgmt., Iowa State College, Ames, Iowa, FM 1058, Aug. 1949.

"Twelfth Annual Report, Area 4, Farm Record Summary, 1948," Agr. Ext. Serv., Farm Mgmt., Iowa State College, Ames, Iowa, FM 1060, Aug. 1949.

"Eleventh Annual Report, Area 5, Farm Record Summary, 1948," Agr. Ext. Serv., Farm Mgmt., Iowa State College, Ames, Iowa, FM 1061, Aug. 1949.

"Farm Record Summary, Area 6, Southern Iowa, 1948," Agr. Ext. Serv., Farm Mgmt., Iowa State College, Ames, Iowa, FM 1062, May 1949.

"Farm Labor, Louisiana and the United States," Agr. Exp. Sta., La. State Univ., Mimeo. Cir. No. 95, June 1949, W. L. Bruner, Jr. and F. D. Barlow, Jr.

"Hogging-Off Corn and Soybeans In The Delta Cotton Areas of Louisiana," Dept. of Agr. Econ., Agr. Exp. Sta., La. State Univ., D.A.E. Mimeo Cir. No. 103, Aug. 1949, W. L. Bruner, Jr.

"Mechanical Harvesting of Corn in Louisiana," Dept. of Agr. Econ., La. State Univ., D.A.E. Mimeo. Cir. No. 104, Aug. 1949, W. L. Bruner, Jr.

"Reducing Sugar Beet Costs," Agr. Exp. Sta., Sec. of Ag. Econ., Mich. State College, East Lansing, Mich., Cir. Bul. 215, June 1949, C. E. Johnson and K. T. Wright.

"Mechanical Cotton Picker Operation In The Yazoo-Mississippi Delta," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 465, July 1949, G. B. Crowe.

"Prices of New Mexico Farm and Ranch Products," Agr. Exp. Sta., N. Mex. A & M College, State College, N. Mex., Bul. 348, July 1949, P. W. Cockerill, Fred Daniels, and R. R. Christeson.

"Economic Facts For Young Farmers," Agri. Econ., Agri. Ext. Service, Ithaca, N. Y., No. 40, Nov. 29, 1949, C. A. Bratton.

"Land Values and the Land Market in North

Dakota," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Bul. 353, June 1949, Rainer Schickele and Reuben Engel King.

"Texas Farm and Ranch Land Prices, 1948," Texas Agr. Exp. Sta., College Sta., Texas, P. R. 1181, J. H. Southern and W. C. Rohrer.

"Keeping Up On The Farm Outlook," Ext. Serv., Wash. State College, Pullman, Wash., Ext. Cir. No. 145, Jan. 30, 1950, Karl Hobson.

"Report of the Administrator of the Production and Marketing Administration, 1949," USDA, Prod. and Mkt. Adm., R. S. Trigg.

"Report of the Solicitor to the Secretary of Agriculture, For the Fiscal Year Ended June 30, 1949," USDA, Washington, D. C., W. C. Hunter.

"Report of the Chief of the Forest Service, 1949," Forest Service, U.S.D.A., Washington, D. C.

"Report of the Chief of the Soil Conservation Service, 1949," U.S.D.A., Washington, D. C.

"Farm Land Ownership in the United States," Bur. of Agr. Econ., USDA, Washington, D. C., Misc. Publ. No. 699, Dec. 1949, B. T. Inman and W. H. Fippin.

"Research at Work, From Farm to You," USDA, Wash. D. C., PA-78, Sept. 1949.

"The 1950 Agricultural Conservation Program Handbook for: ACP-1950-Del.; ACP-1950-Fla.; ACP-1950-Ga.; ACP-1950-Iowa; ACP-1950-Kans.; ACP-1950-Neb.; ACP-1950-Ohio; ACP-1950-W. Va.; ACP-Dec. Statistical Summary 1948."

"The Dairy Farm Business in Manitoba 1942 to 1947," Mkt. Serv., Econ. Div., Dom. Dept. of Agr., Ottawa, Ontario, Canada, Publ. No. 829, Tech. Bul. No. 76, Nov. 1949, H. L. Patterson and H. W. Trevor.

"Types of Farming in Canada," Econ. Div. Mkt. Serv. and Census Div., Dom. Bur. of Stat., Publ. 825, Farmers Bul. 157, Dec. 1949, S. C. Hudson, R. A. Stutt, Wm. Vann Vleit, and J. L. Forsyth.

Fertilizers in Small Lots

ALTHOUGH the total non-farm fertilizers used in this country, such as those bought by home gardeners for use on lawns and vegetable or flower gardens, amounts to only 2 per cent of all farm fertilizers, their manufacture and distribution are of importance.

Many large fertilizer manufacturers depend on these side-line products for part of their income, and numerous specialty producers make these products almost their exclusive business. This industry provides the home gardener and housewife means of obtaining small quantities of the fertilizers they need.

Fertilizer specialists of the U. S. Department of Agriculture have surveyed the field and have estimated the "non-farm use" of fertilizers. This included not only lawns and gardens but maintenance of golf courses, cemeteries, and city parks. When all these are added to the home garden use, they total roughly a third of a million tons. This is made up of 138,000 tons of mixed fertilizers and about 200,000 tons of fertilizer materials bought separately. This figures out that for every ton of mixed fertilizers sold in small lots to non-farm buyers, the industry sold 99 tons to farmer customers. For every 4 tons of separate materials sold for non-farm purposes, the farm buyers took 96 tons.

Metering Dry Fertilizers . . . into Irrigation Systems

(From page 14)

with a suction pump, in addition to the discharge pump, for use in areas under gravity flow water conditions. In the latter machines, a float is attached to the intake pump, which maintains a constant water level in the mixing tank.

The same possibilities of uneven distribution of fertilizer exist when applying dry fertilizers through the irrigation water, as with the use of liquid or gaseous materials, and various means are used to insure even application. In sandy soils and in heavier soils where long runs are encountered, the irrigation period is allowed to proceed for various lengths of time before introducing the fertilizer materials. Another means of accomplishing even distribution is the rapid flushing of the entire fertilizer application onto the

field, using a large head of water. For example, in some cases where a 16-hour irrigation set is necessary, the fertilizer is flushed through the field in the first two hours, followed by a 14-hour run using a low head of water.

The present interest in the application of both liquid and dry materials in solution through the irrigation system would appear to make necessary further studies on the following: (1) Development of better methods of application under various soil conditions; (2) depth of penetration of "liquid" phosphates and potash, under field conditions; (3) the corrosive effect of fertilizer and soil-amendment salts on the metal parts of the machines now in use; (4) the action of these salts on concrete and metal pipe lines.

Better Safflower Is Here

(From page 21)

fallowed land usually range between 350 and 750 pounds per acre. Yields on fallow range from 750 to 1,200 pounds. On land of average fertility, when irrigated two or three times, yields of 1,750 to 2,750 pounds per acre are obtainable.

Safflower, an erect and spiny plant, is suitable for use in the general area of the Northern Great Plains. It does well on a sandy or clay loam soil and needs about as much moisture as flax. It likes a dry atmosphere from date of flowering to maturity. It is more resistant to frost than flax. It has to some extent its diseases and pests, and their control is yet to be studied. But the best cultural and harvesting methods are now pretty well established. It can be cultivated and harvested with the usual farm equipment, and the planting and harvesting dates do not conflict with those for wheat. It grows from 18 to 40 inches high depending upon conditions.

Welcome Alternative

Farmers in that region are looking for a crop that will fit into their rotations now that wheat acreage allotments are back again and long-time outlook reports are indicating the probable need for further reductions of wheat. Experimenters are now agreed that safflower can replace a small-grain crop under certain conditions. The Nebraska Agricultural Experiment Station, which has done much work on safflower, says it fits into the rotation systems of that State in the same way as any other full-season, spring-planted crop. A farmer in Nebraska says that his field of safflower, after being accidently overrun by cattle, proceeded to weather a hailstorm and a 4-inch snow, and yet yielded him 350 pounds of seed an acre.

An investigator got a somewhat different response, by the way, when he questioned one observer at a western institution. The best use of safflower, he affirmed, would be to plant in triple rows, using heavily spined varieties, around your watermelon patch.

Safflower is indeed a thistle-like plant but it will not become a weed, say the experimenters, because the seeds do not lie dormant in the ground. Its blossoms open early in the morning and vary from lemon and orange to burnt umber. The plant was once used as an ornamental in some gardens and earlier than that a dye was made from its flowers.

Among the agencies that have worked to develop and understand the crop are the University of Nebraska which has been at it the longest, the Northern and Southern Regional Research Laboratories, and the U. S. Department of Agriculture. The work has not been overlapping—each agency has studied a different phase or adaptation. Several commercial firms have done experimental work in production, extraction, and utilization.

Much of the present acreage is contracted to certain oil companies that are definitely interested in the potentialities. The 1950 acreage is expected to double last year's. Markets are not yet well established, and so arrangements for disposal should be made before any farmer begins to grow the crop. Several processing plants are planning to expand their operations, and one or two additional plants are projected. Several companies are looking for additional acreage to keep their establishments running at capacity.

Safflower-seed oil is judged by the technologists to be equal to linseed oil for many purposes and better than linseed for others. It is especially good as a drying agent. Paint in which it is used has been found to be free from yellowing and checking.

Other commercial possibilities of the safflower output are known or are under study. The oil cake and meal provide protein feeds in an area where such supplements are needed. The edible quality of the oils and their possible uses in foods are being studied by Nebraska and one of the regional research laboratories. The hulls are coarse and heavy. If the seed are decorticated there will be a problem of disposal. Use as fuel is the only method of disposal yet proposed. Furfural has been mentioned but this use has not been investigated.

Farmers in western Nebraska and Colorado grew most of the commercial crop last year. Farmers in Washington, Oregon, and Idaho have had satisfactory yields, but the present processing plants are so distant that the growers' profits are cut by the transportation charges. Some California growers are going in for production on a commercial scale this year, using certified or proved seed.

It was expected that more than eight million pounds of oil would be extracted from the entire 1949 crop of safflower. The yields of the crop to be grown this year and the final output will be watched by many thoughtful farmers.

Food for Thought About Food

(From page 20)

beans or peanuts as by growing beef cattle on it. Some 15 million acres are now being planted to soybeans and peanuts for direct harvesting. Soybeans normally contain about 17% oil and 37% protein, and peanuts about 47% oil and 30% protein. Both are finding their way to market as substitutes for butter and meat. Butter consumption fell from about 17 pounds to 10 pounds between 1935-39 and 1948, and the consumption of margarine and other vegetable fats was correspondingly increased.

The legume-seed crops are soil-exhausting crops. It is doubtful whether the farmer breaks even on intake and outgo of nitrogen in his soil by growing them. Important corrective measures have been found for the peanut crop in the development of a 1-year rotation with blue lupines, the latter crop being used as a winter cover. Plantings of lupines have multiplied tenfold during the last 8 years and now stand at about 500,000 acres in Georgia alone. Sweet clover and alfalfa are probably the best soil-improving crops to grow in rotation with soybeans in the Corn Belt.

Yeasts Important as Possible Protein Producers

Protein production by yeasts offers highly important possibilties. The distribution of the essential amino acids in vegetable proteins leaves much to be desired. Wheat is low in the vitally important lysine. But the proteins of yeasts are surprisingly similar to those of meat, and this makes them especially useful as supplements to cereals.

The best known yeast for commercial exploitation is *Torulopsis utiles.* This

can be grown in large masses on cheap carbohydrate materials, such as molasses, vegetable wastes, potatoes, wood, and sulfite-waste liquor from the wood-pulping industry. Other yeasts are being used in the beer and whiskey industries. Still others have been developed for fat production. It has been estimated that 1 acre of concrete-enclosed pond filled with algae and yeast could produce fat equivalent to that yielded by 25 acres of a vegetable-oil crop. The prospects are bright for the hybridization of superior yeasts for the production of protein foods.

Yeasts can be produced in quantity within a few hours or days. Their efficiency in protein production from a given quantity of carbohydrate is about 65%, in comparison with about 20% for pork, 15% for milk, 5% for poultry, and 4% for beef. The produce of an acre of land can be transformed into 10 times as much industrial yeast protein as meat protein.

The basic materials for yeast production are carbohydrates and nitrogen. In addition, use must be made of mineral salts carrying phosphorus, potassium, magnesium, and sulfur. By continuous-flow aeration processes, large-scale production can readily be put into operation. Large tonnages of yeast proteins are already being produced to fortify breads, soups, gravies, and candies and as vitamin supplements. Highly important potentialities in their production lie ahead. Their use will be limited by economic factors rather than by any difficulties in technical development of the yeast industry.

Other Methods of Food Production Being Explored

Plants are relatively inefficient utilizers of the sun's energy. A 100-bushel corn crop uses only about 0.3% of the solar radiation that falls on the acre of land that produces it. The commercial goal is to make more efficient use of this energy by synthetic production of carbohydrates without the use of plants. This calls for unlocking the secrets of chlorophyll, which is credited with fixing 100 billion tons of carbon annually. Large-scale research programs are now under way to this end.

About 90% of the earth's photosynthesis is carried on in water, which covers about 2½ times as much surface as the land. Ocean water is a highly favorable medium for plant and animal life, because it occurs in dependable abundance, its temperature is uniform, it is well aerated, and it contains all the necessary mineral nutrients. Zooplankton, consisting of animals from 1 to 10 mm in length, can be made into a very tasty dish. They have a yield potential greater than the world's total meat supply.

Over 2½ million tons of fish are being harvested annually from the fresh waters of our 48 states and Alaska. About two-thirds of this is used for food. It is believed that the catch could be increased 50%. Some 25,000 fish ponds have been constructed in the United States during the last 15 years. Their 200-pound-per-acre yield could be tripled by proper management, including the use of fertilizer.

The agrobiologic school believes that the primary limitation to yield, other than the ability of plant protoplasm to do work, lies in the nitrogen content of the soil and of the crop that grows on it. The nitrogen content of plants varies between about 0.3 and 3%. If, whatever the crop, the same amount of nitrogen is removed from the soil, then the acre yield of one that contains only 0.3% nitrogen could be 10 times that of another that requires 3% nitrogen.

On this basis, if population pressure increased to a point that made it necessary, a gradual change could be effected toward the production of plants of the lowest nitrogen and highest carbon contents. Forest trees and sugar cane would qualify for this purpose. To overcome the low-protein disadvantage, the wood and cane, together with the necessary mineral nitrogen, could be fed to yeast with the resulting production of meat substitutes.

Final Answer Found in Energy Resources

The answer to the problem of producing still larger supplies of food will be found in the use of much greater amounts of the vast supplies of energy that surround us. At the moment, we are depending primarily on stored energy that had its origin in the sun. These energy resources consist mostly of coal, petroleum, natural gas, oil shales, and tar sands. About 98½% of the world's original known coal supply, 95% of its natural gas, and 90% of its petroleum are still available for use. The oil-shale and tar-sand resources remain to be explored. The exhaustion of these natural resources lies so far in the future as not to cause undue concern.

Large amounts of water power are going to waste. Little has been done toward harnessing the winds and the tides. The potentialities of atomic energy are being explored. But the primary source of energy is the sun. Its yearly output exceeds all the stored energy on earth. A 15-day period of sunshine provides energy equal to that contained in the world's entire coal deposits. A field of corn could be grown to maturity in a few hours if all the sun's energy that falls on it could be utilized.

Engines for converting the sun's rays into mechanical energy are in their infancy, but highly effective ones are not impossible. In due time the known principles of photochemistry and photoelectricity are quite likely to be put into operation in the capture and transmission of the vast quantities of the sun's energy that are now being wasted on the Great American Desert.

Given adequate energy resources, which seem assured for the not too distant future, gullied land can be leveled, and that in the shallower parts of the sea can be reclaimed from the sea. Even the ocean water can be distilled for use in making the desert bloom. Taking all the known facts into careful consideration, we need have no fear whatever of any lack of capacity to feed ourselves permanently in accordance with our desires. All we need to do is to make intelligent use of the abundant resources at our command.

Can We Afford Enough Fertilizer . . .

(From page 26)

the highest yield with one exception, and that was Stout. Beryl turned down an alfalfa sod and if he had side-dressed his corn with nitrogen at the last working I am satisfied he would have had at least 10 more bushels. Stout used more fertilizer and had bottom land with alfalfa sod but got a very poor stand and planted a hybrid that will not make extra high yields.

The second highest yield was Albert Post and his corn was planted on a hill that had had the grass taken off for 30 years and nothing put back. He had a slope of from 10 to 15 per cent, had to strip crop, and the soil was not over six inches at the deepest place and was underlaid with a soap-stone shale. His land never had been limed, but he did apply nearly the amounts of the three elements that the chemists tell us 100 bushels of corn will take from the soil. In other words, he put in the soil just about the amount that he expected to take out and he got what he expected.

These figures do not tell the whole story, only about half. For instance in Post's case, suppose that he had planted in the usual way with the average amount of fertilizer. In order to grow the same amount of corn which was needed in his feeding program, he would have had to plow nearly three acres of that steep hill instead of one. That would have increased his labor

Name	Yield Bu.	Value $1.50 per Bu.	Fertilizer cost	Profit
Beryl Hardin...	125	$188	$44	$144
Albert Post.....	118	177	38	139
Carl Knotts.....	115	172	46	126
Henry Vincent..	108	162	28	134
Jack Lucas.....	104	156	31	125
Raymond Stout.	100	150	49	101
James Kerns....	97	146	23	123
Satterfield.....	77	116	32	84
Average for county.....	43	65	*7	58

* We had no way of finding the exact amount of fertilizer the average farmer uses on corn, but from the experience of the class in talking with their neighbors, this figure was arrived at. If it is two small, the average profit is less.

costs more than three times, to say nothing of the risk of erosion in plowing so much hill land.

How much plant food did these men use? No two of them used the same amount, but the ones that made the greatest profit above the fertilizer cost applied about an average 140 pounds of nitrogen, 80 pounds of phosphorus, and 120 pounds of potash.

How did they apply it? No two of them applied it in the same way. Some turned it all down; some turned down part and worked in part; some put part in the row; and nearly all used a sidedressing of nitrogen at last working. Which method is best we have not determined but believe from observation that to plow down the phosphorus and potash and use the nitrogen in the row and as a sidedressing will give the best results.

All of them used a hybrid corn; five of the highest yields planted West Virginia B 17, and the seed was locally grown. Two planted Ohio W 17 which was also locally grown.

Look at these figures. If you are going to grow corn in the hill country where we must plow our lands just as little as possible, do you think you can afford to use less than the maximum amount of fertilizer, to say nothing of the impoverishment of your soil if you don't?

I do not claim that we will have to buy all this plant food in the form of commercial fertilizer, for we can grow a lot of the nitrogen with the use of legumes. However, we are going to have to put it in there if we expect to take it out in the form of crops that we can feed our livestock or eat.

Soil Testing in Georgia Is Rolling Onward

(From page 7)

ing is that gained by the man-to-man conversation which is obviously much better than correspondence that is often confusing, time-consuming, and expensive.

In addition to the routine testing of soils for fertilizer and lime requirement, the Mobile unit will be used for trouble-shooting in areas of the State where farmers are having difficulty, for demonstration, plant-tissue testing, and for locating fields suitable for experimental plots.

The outlook for mobile soil testing in Georgia is bright. Already another unit, a route van, has been obtained. This second unit will be in operation before July of this year. Each unit is capable of analyzing from 10,000 to 15,000 samples annually at a cost comparable to that when the analysis is made in a central laboratory. It is believed that six such units could take care of the needs for the entire State. The advantages of this type of soil testing, such as more rapid results, a greater educational value, and more accurate recommendations due to a better knowledge of local conditions, cannot be overlooked. The only disadvantage at the present is that the demand for "soil testing on the spot" far exceeds present facilities for doing it.

Extension Education in Soils in Wisconsin

(From page 25)

were set up in all counties in Wisconsin where sources of liming materials were available. In counties where limestone was available, this project afforded employment for hundreds of men in the quarrying of the rock and the lime-grinding operations. A total of better than seven million tons of lime was produced and spread on Wisconsin farms as a direct result of this program.

The impetus given to lime production through the setting up of several hundreds of these work relief lime-grinding and marl-digging projects has been reflected in our present large-scale agricultural lime production operations in Wisconsin. Better than two million tons a year are now being produced and spread on Wisconsin farms. The application of lime has always been one of the chief soil-building practices by which Wisconsin farmers earned their AAA payments. Records show that a total of over 19 million tons of agricultural lime has been produced and spread on Wisconsin farms since the inauguration of the work relief program of lime production projects starting in 1934. This program of lime production as a part of the federal work relief agencies was administered by county agents and their county boards and supervised by the extension specialist in soils.

Fertilizer Demonstrations—A Powerful Force

But perhaps the most outstanding program of education in soil improvement as viewed from the standpoint of getting farmers started in use of fertilizers has been our extension project of fertilizer demonstrations carried out in cooperation with county agricultural agents. This extensive program of fertilizer demonstrations has been made possible through generous contributions of the fertilizer industry and affiliated educational agencies. The American Potash Institute, the Middle West Soil Improvement Committee, and certain of the manufacturers of nitrogen fertilizer have been the chief contributors. For many years these agencies have supplied between $3,000 and $5,000 worth of fertilizer for these demonstrations and have further supported our work with leaflets, reprints, and circulars.

In addition to this type of work has been our whole-farm demonstration type of extension project, set up in cooperation with the Tennessee Valley Authority. This work was inaugurated in 1940 and is still functioning in about 45 Wisconsin counties.

In the early period of this program of large-scale demonstrations, the manufacturers of fertilizer distributing machinery supplied a considerable number of fertilizer-grain drills which were hauled on trailers by county agents over their counties in the setting up of these acre-scale demonstrations on small grain and seedings of legumes.

The yield data secured from these fertilizer plots, on small grain as well as on the hay crop the following year, have always been tabulated in all-state reports. For many years, 5,000 or more copies of these mimeographed reports were distributed among the fertilizer manufacturers and their dealers in Wisconsin. The reports were also sent out to Smith-Hughes teachers of vocational agriculture and to other educational leaders, including the AAA state and county committeemen.

The most valuable part of the demonstration in the early days was to sell the county agent, the Smith-Hughes teacher, and the county AAA committeemen on the use of fertilizer. Even at the present time, the county agent can best keep himself informed on new practices in fertilizer usage by cooperating in the setting up and carrying out

of demonstrations on the use of nitrogen, potash, and phosphate.

Fertilizer Tonnage Increases in Spite of Shortages

The continuous teaching and preaching of fertilizer usage at winter meetings and via farm press, radio, and the actual demonstration of fertilizers even during the war and immediate postwar period, when there was never enough fertilizer to supply demand, did result in arousing a tremendous interest in the use of fertilizers; and in spite of shortages, there were large annual increases in tonnage consumption in Wisconsin. In 1939 a total of 42,623 tons of fertilizer was used by Wisconsin farmers, in 1948 a total of 404,121 tons.

This tremendous demand for fertilizer over the period of the past 10 years has resulted in the building of six new fertilizer factories in Wisconsin and four additional factories just across the Mississippi River on the Iowa-Minnesota side. These 10 new factories represent an investment of several million dollars, with capacity for the annual production of over 500,000 tons of fertilizer.

All of this increase in the use of fertilizers and capacity for the production of fertilizers in Wisconsin has come about in spite of adverse criticism during the war years that our extension program in soils was futile and that to urge farmers to use more commercial fertilizer was a waste of time, since there was not enough being manufactured to supply demand. We were told we might as well forget about our program of field demonstrations and even radio and platform presentation of the story of fertilizer usage, because farmers couldn't get it anyway. But my argument in rebuttal has always been that if we create a demand for fertilizers, somehow or other farmers will eventually have their demands satisfied. And this has proven to be the case. Actual capacity for the production of fertilizer in Wisconsin has been increased tenfold during the past five years.

Summary

1. Soil tests have given and are giving county agents and other educational leaders an intelligent basis for their recommendations of lime and fertilizers.

2. The psychology of the soil test is a most important factor in getting farmers started in the use of lime and fertilizers.

3. Even though soil tests are not a 100 per cent accurate guide in predetermining the need for lime and fertilizers, yet when backed up with information as regards previous crop and field treatment history, they are a real help in the diagnosing of crop ills and soil deficiencies.

4. Field demonstrations with fertilizer give a more positive answer as to what a farmer can expect in the way of crop response from its use. Seasonal conditions, however, greatly influence the response which crops show to fertilizer treatment, and for that reason the county agent or specialist must rationalize the results in the light of the seasonal factors.

The best evidence that extension work in soils has paid off in terms of crop improvement are the following facts:

Over 19 million tons of lime have been produced and applied on Wisconsin's farms in the past 15 years.

Over 2¾ million tons of commercial fertilizers have been used on Wisconsin farms in the past 15 years, with a present annual consumption of about 400,000 tons.

Alfalfa for the past 10 years in Wisconsin has averaged over a million acres, and in 1949 totaled 1,653,000 acres.

Wisconsin's corn crop, totaling nearly 125,000,000 bushels in 1949, was the best in the State's history (due in part to a most favorable season). Average yields, however, for the past 10 years have steadily increased, and even though a major factor in the increases in yield has been the contribution of the higher-yielding varieties of hybrid strains, yet the influence of the millions

of tons of lime and fertilizer and the reflected effect on more nitrogen fixation by legumes have played their part.

Higher average yields of grain over the past 15 years are mute testimony to factors of improvement in varieties and soil fertility. Tremendous contributions have been made by the Department of Agronomy and associated Departments of Genetics and Plant Pathology in the breeding and selection of these new high-yielding strains of disease-resistant varieties of oats, barley, and wheat. It can be truthfully said that soil-fertility improvement has made possible the achievement of larger acre yields of hybrid corn and new grain varieties. Education in soil conservation and soil-fertility improvement has been implemented by the Federal action programs of the AAA and the Soil Conservation Service.

But there is still much to be done, much to be said, and much to be demonstrated in the field of soil-improvement practices in years to come.

Here Overstecken!

(From page 5)

ery stock, flowers, fruits, vegetables, pork and bacon, bulb raising, cheese making, and egg production par excellence.

The longest-lived and most historical of these famous Dutch specialities in farming are found in truck growing. Vegetables from Holland found favor with kings and lordly castle-owners back in the Middle Ages, and the selected plants and potted flowers grown in the low country were basic supplies for the courts of western Europe. Today the vegetable seeds, corms, and bulbs, as well as the certified seed potatoes, which Holland boasts about with perfect right, are valued export commodities at a time when export trade is widely sought. That some of the population draws the belly belts tighter so that some of the most delicious food may be sent out to earn exchange is probably just as creditable now as having to get along with a few skimpy meals during the war.

Unlike the case in our country with its vast land areas open to selfish exploitation, Holland has had its back to the wall, as it were, and to their farmers soil conservation meant more than a catchy slogan. Hence to maintain the kick and the comeback in fertile soils was a prime objective through the years for Holland farmers, making their country the leading user of commercial plant food. Belgium, Luxembourg, and Germany are the next highest fertilizer users.

Home manufacture of commercial fertilizers has been a thrifty necessity for Holland, and this has probably induced the heavy per-acre application. In pounds to the acre the Netherlands uses 55 pounds of nitrogen, about 90 pounds of phosphorus, and 88 pounds of potash, or 15 to 20 times the average rate for the United States as a whole. The world average runs somewhere between three and five pounds to the acre of agricultural land. Thousands of extra tons of plant-food supplies were imported by Holland farmers in the post-war period when domestic manufacture was slowed down. Grassland production has been especially helped by fertilizer imports, but the nitrogen used mostly in that regard is now being produced entirely by home factories with Marshall Plan assistance.

Grass combined with mineral plant food makes for a more lasting soil and a better balanced agriculture on the livestock pattern. So in Holland with its emphasis on dairying and grazing, the heavy fertilizer usage comes in good stead for cheap pasture promotion. Yet increased pasture is not the only aim. In addition to grazing the green meadows and cutting the hay for stacking and curing, a great impetus to ar-

tificial and mechanical grass-drying has developed. We saw much of that enterprise.

There are nearly 115 grass-drying plants available to farmers, mostly cooperative in character. South Holland and Friesland each have more than 25 of these dryers. Forage dehydration and the steaming of potatoes for hog rations are two group enterprises which might well be adapted in America, and more explanatory discussion is deserved than space permits.

Farm reliance upon good livestock and the proper improvement of the species as well as the domestic use and wide exports of livestock products are basic points in the husbandry of Holland. Our touring farmers rejoiced at the green meadows filled with cattle of real capacity—most of them the familiar black-and-whites known as Friesians, the solid black-bodied kind with white heads and bellies, called Groningens, and the blocky cows resembling our Shorthorns, but with red-and-white markings, similar to those in Germany, parts of France, and Switzerland—the Meuse-Rhine-Yssel cattle. These latter are the main draft animals in middle Europe.

AS for hogs, Holland raises just two regular breeds. One is for lean meat and bacon—the Landrace, often used for crossbred experiments under contract in this country; and the improved large white hogs, heavyweight fat stock. Of less frequent appearance in the rural scene are the Texel sheep, making up 70 per cent of the flocks, being a mutton-wool breed, white-faced, with long wool of average fineness, hardy and needing no shelter except in the very coldest of winters.

Used as cash income from mixed farming, Holland's poultry and ducks are under regular and systematic improvement work. The main chicken breeds are White Leghorns, Rhode Island Reds, and Barnevelders. A big increase in flocks occurred after the war and especially under the ECA aid program which brought tons of concentrates into Holland. Not only did this build up the poultry industry again, but it made possible a big jump in livestock products exports—from 550 tons of butter and 15,000 tons of cheese in 1947 to 24,000 tons and 22,000 tons respectively in 1948. Likewise, this available feed supply to eke out what home-grown grain and pastures provided enabled officials to remove milk, butter, and eggs from the domestic ration list, soon to be followed by meat and cheese.

MOST of us taking in the wonders of Holland last summer were struck by at least two significant factors that have contributed greatly to the advances these land-starved burghers have made in quality and quantity of farm production. One point is that the stockmen and their government are allied together in practically all regulatory methods designed to protect and increase the efficiency of domestic animals. The other is that a more progressive system of agricultural information and field education has sprung from the scientific and technical institutions and filtered down to the dirt farmer than seems to be the rule in any other European country visited.

This somewhat narrows the field in which our country and its best extension workers can expect to introduce educational subject matter that is really new to Dutch farmers. Perhaps our best bet in this case is to help them refine and redirect and reorganize some of the already well-established, and widely accepted and used, extension courses. I am of the firm belief that Holland—and maybe Switzerland—could send us "missions" too, teaching us some very vital things in conservation, thrift, and neatness. To be frank about it, the sharp contrast in good appearance and orderly care seen so commonly in Holland against the more ragged, unkempt, and sometimes slovenly and wasteful signs, all too evident in our own rural midst, calls for a dose of humility on our part, rather than so

much "superior advice." We have had so much to do with, while they have had so little—that's the economic reason often heard. But don't forget that a sense of order, thrift, and pride in craftsmanship is something that we used to have in greater abundance than we enjoy today—maybe because our new immigrant citizens brought it along with them, and their offspring have since lost or mislaid it, under the pressure of our American age.

We won't have to pay duty on any imports of that kind we bring in and it will strengthen our courage and our self respect to get them.

Agricultural education and research are linked up with extension information to a surprising extent in Holland, compared with the situation found in adjacent countries that often possess as much know-how and about as advanced science but where no signal attempt to spread the knowledge to farmers has ever been successfully made.

AWAY back in 1890 when the State Agricultural College of Wageningen was founded there was money allotted to pay for agricultural teachers. The provinces of Friesland and South Holland at that early date had advisers already at work. This advisory service in 1948 was existing in agriculture with 22 advisers, in horticulture with 18, in dairying with 10, in livestock husbandry with 11, in poultry culture with 9, and even in beekeeping with 2 advisers.

The advisers form a link between the government and the farmers and between science and practice. They lecture, write, demonstrate, and organize. Manurial, plant-breeding, and cultivation tests and trials are major activities. Although this excellent start proved helpful and inspiring to Dutch farmers, the main trouble with it at first lay in the fact that aid and advice were open only to farmers who asked for them in a formal way. This left the ones most in need of assistance out in the cold, inasmuch as the lively, alert, and ambitious ones always had enough questions and requests on file to take up all the spare time left to the advisers. To some extent, even in our own country, the progressive seekers after new knowledge are apt to get first call from the extension agents. It all stems back to school usage, where the keen and responsive pupil attracts the chief attention of the teacher.

HOLLAND simply expanded its advisory system a few years ago and installed 450 agricultural and about 230 horticultural adviser-assistants, and on top of that the government established pilot farms here and there, choosing farmers with advanced technique to operate them. This effort is directed to the need of small landholders—the 15- and 20-acre people, and the red tape of asking for advice has been largely eliminated.

In the past 50 years a system of agricultural and horticultural education has become firmly set up. There is a network of more than 1,000 courses and evening classes. Low tuition fees and book charges are the rule, and study allowance grants are often used to overcome financial obstacles. Young people attend winter secondary schools as well, taking an entrance examination and receiving a system of follow-up instruction and farm visits during the summer months where they are employed. These same teachers who make the rounds checking up on their winter students are also used widely in management of the demonstration plots and experiments.

In cooperation and farm organization fields I doubt if we can do very much to instruct the Dutchman. To begin with, there are three general farm societies, the Royal Agricultural Commission, the Catholic Farmers and Growers Union, and the Christian Farmers and Growers Union. There are also three workers' associations—each one a parallel unit like the ones just noted—general agriculture and the Catholic

and the Protestant farm employees. These six bodies in turn cooperate with the Agricultural Foundation at the Hague. This central unit is trying to evolve a series of regulations that will make legal certain binding duties and responsibilities for all farm producers in the interest of group welfare and efficiency.

In addition, Holland has 1,300 farm credit banks and literally hundreds of purchasing, marketing, and manufacturing cooperatives run by farmers. In the latter zone of operation, not only butter and cheese, but beet sugar, potato farina, strawboard for export, phosphate for fertilizer, and dried grass are made in large amounts.

IN short, in almost any complex and vital field of agricultural advancement—even in studying production in the colonial tropics—you'll be happy to find that the positive, pink-cheeked Dutchman has slowly but surely crossed off mistakes and marched forward.

An authority who confirms my enthusiasm about Holland is Dean Arthur Deering of the University of Maine, who has spent a few months in that country on one of the many U. S. special missions abroad. He writes home that "the Dutch people and their Nation are among the finest in the world." He praises their ambition, their fairness, and their whole philosophy of life. Their officials encourage farmers to be self-reliant and to avoid excessive debts and loans. Although the people do not have much money according to American standards, they appear well and happy, the Dean states. Like many others who look into the agricultural education plan in Holland, Dean Deering believes that no country has a better integrated system of research, teaching, and extension.

Yes, indeed, it's not just passing over his canals that the Dutchman says "Here Overstecken." He steps out on many fronts—firm, wide, and handsome.

Simplex
SOIL TESTING

Quantitative as well as Qualitative
(Results in ppm and pounds)

- Accurate
- Easy
- Inexpensive
- Quick

EVERY CROP GROWER SHOULD KNOW HIS SOIL

The exact knowledge gained by Simplex Soil Testing pays big dividends, making the cost of the equipment insignificant.

The Complete
SIMPLEX SOIL TEST OUTFIT

100 to 300 tests can be made for each of the following soil chemicals:

Nitrates	Phosphorus	Potassium
Acidity	Magnesium	Iron
Aluminum	Sodium	Calcium
Ammonium	Nitrites	Sulfates
Carbonates	Chlorides	Manganese

Plus 4 reserve tests and tissue tests for Nitrates, Phosphorus and Potassium. Packed in a strong metal chest equally adaptable to field and office use. Only $36 complete. F.O.B. Cleveland.

The Junior
SIMPLEX SOIL TEST OUTFIT

Contains all the materials and solutions necessary to make 100 to 300 tests for each of 6 soil chemicals plus tissue tests for Nitrates, Phosphorus and Potassium. Only $25 complete. F.O.B. Cleveland.

The Farm
SIMPLEX SOIL TEST OUTFIT

Designed for the smaller grower, it contains 100 tests for each of 5 elements plus tissue tests for Nitrates, Phosphorus and Potassium. Only $16 complete. F.O.B. Cleveland.

FULL DIRECTIONS AND COLOR CHARTS ACCOMPANY EACH SET.

Soiltex—new and improved—A test for soil acidity—with complete instructions and equipment for making approximately 100 determinations. $1.25 per package postpaid.

THE EDWARDS LABORATORY
P.O. Box 2742-T • Cleveland 11, Ohio

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (General)

Reprints

F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What is the Matter with Your Soil?
J-2-43 Maintaining Fertility When Growing Peanuts
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
FF-8-43 Potash for Citrus Crops in California
A-1-44 What's in That Fertilizer Bag?
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—the Aristocrat
CC-6-45 Know Your Soil
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
ZZ-11-45 First Things First in Soil Fertility
H-2-46 Plow-sole Placed Plant Food for Better Crop Production
T-4-46 Potash Losses on the Dairy Farm
Y-5-46 Learn Hunger Signs of Crops
AA-5-46 Efficient Fertilizers Needed for Profit in Cotton
WW-11-46 Soil Requirements for Red Clover
ZZ-12-46 Alfalfa — A Crop to Utilize the South's Resources
A-1-47 Fertilizing Vegetables by Applying Fertilizer to Preceding Cover Crop
I-2-47 Fertilizers and Human Health
P-3-47 Year-round Grazing
T-4-47 Fertilizer Practices for Profitable Tobacco
AA-5-47 The Potassium Content of Farm Crops
DD-6-47 Profitable Soybean Yields in North Carolina
TT-11-47 How Different Plant Nutrients Influence Plant Growth
VV-11-47 Are You Pasture Conscious?
BBB-12-47 The Management of Mint Soils
E-2-48 Root Rot of Sweet Clover Reduced by Soil Fertility
O-4-48 Legumes Improve Drainage and Reduce Erosion
R-4-48 Needs of the Corn Crop
X-6-48 Applying Fertilizers in Solution
AA-6-48 The Chemical Composition of Agricultural Potash Salts
GG-10-48 Starved Plants Show Their Hunger
II-10-48 The Need for Grassland Husbandry
OO-11-48 The Use of Soil Sampling Tubes
TT-12-48 Season-long Pasture for New England
B-1-49 Hardening Plants with Potash
C-1-49 Military Kudzu
D-1-49 Permanent Pastures in South Carolina
E-1-49 Establishing Bermuda-grass
F-2-49 Fertilizing Tomatoes for Earliness and Quality
J-2-49 Increasing Tung Profits with Potassium
L-3-49 The Development of the American Potash Industry
N-3-49 Are You Shortchanging Your Corn Crop?
Q-4-49 Potassium in the Oregon Soil Fertility Program
S-5-49 Some Practical Considerations in the Addition of Micronutrients to Fertilizer
U-5-49 The Soil and Human Health
Y-6-49 Heredity Plus Environment Equals a Corn Crop
Z-6-49 The Search for Truth
AA-6-49 Recommended Practices for Growing Peanuts
BB-8-49 The Red Hills of the Piedmont Need More Green Blankets
CC-8-49 Efficient Vegetable Production Calls for Soil Improvement
EE-8-49 Why Use Potash on Pastures
FF-10-49 We're Learning How to Grow Corn in Alabama
GG-10-49 What Makes Big Yields
HH-10-49 Sesame—New Oilseed Crop for the South
JJ-10-49 Potash in Wisconsin's Test-Demonstration Program
KK-10-49 An Approved Soybean Program for North Carolina
LL-10-49 We Turn to Grass
MM-11-49 Things Learned From 1949 NE Green Pasture Program
NN-11-49 Irrigation Opportunities in Southeast
OO-11-49 Why the Push on Potash
PP-11-49 The Use of Gypsum in Irrigation Water
QQ-11-49 Some Fundamentals of Soil Building
RR-11-49 Alfalfa as a Money Crop in the South
SS-12-49 Fertilizing Vegetable Crops
TT-12-49 Grow Lespedeza Sericea for Forage and Soil Improvement
UU-12-49 Pacific Northwest Knows How to Grow Strawberries
VV-12-49 Observations of a Fieldman on the Value of Experimental Fields
A-1-50 Wheat Improvement in Southwestern Indiana
B-1-50 More Corn From Fewer Acres
C-1-50 Fertilizer Trends in South Carolina
D-1-50 Know Your Soil I. Delanco Sandy Loam
E-1-50 More Fish and Game
F-1-50 A Simplified Field Test for Determining Potassium in Plant Tissue

---

THE AMERICAN POTASH INSTITUTE
1155 16TH STREET, N. W. WASHINGTON 6, D. C.

FREE LOAN OF EDUCATIONAL FILMS

The American Potash Institute will be pleased to loan to educational organizations, agricultural advisory groups, responsible farm associations, and members of the fertilizer trade the motion pictures listed below. This service is free except for shipping charges.

FILMS (ALL 16 MM. AND IN COLOR)

The Plant Speaks Thru Deficiency Symptoms (Sound, running time 25 min. on 800-ft. reel.)
The Plant Speaks, Soil Tests Tell Us Why (Sound, running time 10 min. on 400-ft. reel.)
The Plant Speaks Thru Tissue Tests (Sound, running time 14 min. on 400-ft. reel.)
The Plant Speaks Thru Leaf Analysis (Sound, running time 18 min. on 800-ft. reel.)
Save That Soil (Sound, running time 28 min. on 1200-ft. reel.)
Borax From Desert to Farm (Sound, running time 25 min. on 1200-ft. reel.)
Potash Production in America (Silent, running time 40 min. on 400-ft. reels.)
In the Clover (Sound, running time 25 min. on 800-ft. reel.)

OTHER 16 MM. COLOR FILMS AVAILABLE ONLY FOR TERRITORIES INDICATED

South: Potash in Southern Agriculture (Sound, running time 20 min. on 800-ft. reel.)
Midwest: New Soils From Old (Silent, 800-ft. edition running time 25 min.; 1200-ft. edition running time 45 min. on 400-ft. reels.)
West: Machine Placement of Fertilizers (Silent, running time 20 min. on 400-ft. reel.)
Ladino Clover Pastures (Silent, running time 25 min. on 400-ft. reels.)
Potash From Soil to Plant (Silent, running time 20 min. on 400-ft. reel.)
Potash Deficiency in Grapes and Prunes (Silent, running time 20 min. on 400-ft. reel.)
Bringing Citrus Quality to Market (Silent, running time 25 min. on 800-ft. reel.)
Canada: The Plant Speaks Thru Deficiency Symptoms
The Plant Speaks, Soil Tests Tell Us Why
The Plant Speaks Thru Tissue Tests
The Plant Speaks Thru Leaf Analysis
Borax From Desert to Farm

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.
Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.
Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.
Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.
West: Department of Visual Education, University of California, Berkeley 4, California.
Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.
Department of Visual Instruction, Oregon State College, Corvallis, Oregon.
Bureau of Visual Teaching, State College of Washington, Pullman, Washington.
Canada: National Film Board, Guelph, Ontario, Canada.

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

A young man, newly married, was filling in his Income Tax form. In the space for allowance claimed in respect of wife he joyfully wrote the amount. Then he came to the section marked "Allowance claimed in respect of children." He paused, pondered, and then with a flash of inspiration wrote: "Watch this space."

* * *

He appeared before the company officer, charged with using insulting language to his sergeant.

"Please sir," he protested, "I was only answering a question."

"What question?" snapped the officer.

"Well, sir, the sergeant said, 'What do you think I am?' and I told him."

* * *

An old colored employee was driving a truck along one of the New Jersey highways at a good clip one day, a good bit over the speed limit. A traffic patrolman picked him up, and when he had pulled over to the side, said:

"What's the matter, do you realize you were going 55 miles an hour?"

"No, suh," said the colored man, "Ah didn't know dat!"

"Well, haven't you got a governor on that truck?"

"No, suh, de governor's in Trenton—dat's fertilizer you smells."

* * *

The customer beckoned to the new waitress. Looking rather embarrassed, he said, "Could you tell me where the smoking room is?" "Oh," the waitress replied, "you can smoke right here at the table."

One girl asked another how to make love. "You can't really describe it," the friend replied. "You just stand still and defend yourself."

* * *

The three little Scouts who had been sent out from the meeting to do their good deed or else returned to report. "I did my good deed, sir," the first reported to the Scoutmaster. "I helped an old lady across the street."

"I helped her across, too," said the second Scout.

"Me too!", said the third.

"Do you mean," the Scoutmaster demanded, "that it took three of you to help one old lady across the street?"

"Oh, yes sir," the scouts agreed. "You see, sir, the old lady didn't want to cross the street."

* * *

The shapely chorine addressed the doctor: "I want you to vaccinate me where it won't show."

Doctor: "Okay, my fee is ten bucks in advance."

Chorine: "Why in advance?"

Doctor: "Because I often weaken and don't charge anything."

* * *

Reporter: "And what would you say has been the chief source of your strength and health?"

100-Year-Old: "Vittles."

* * *

He: "C'mon, give me a kiss."

She: "No, I've got scruples."

He: "That's all right. I had 'em twice."

FERTILIZER BORATES

a "A NEW HIGH GRADE" *product*

1—FERTILIZER BORATE, HIGH GRADE—
a highly concentrated sodium borate ore concentrate containing equivalent of 121% Borax.

2—FERTILIZER BORATE—a sodium borate ore concentrate containing 93% Borax.

Both offering economical sources of BORON for either addition to mixed fertilizer or for direct applications where required

Each year larger and larger acreages of our cultivated lands show evidences of Boron deficiency which is reflected in reduced production and poorer quality of many field and fruit crops. Agricultural Stations and County Agents recognize such deficiencies and are continually making specific recommendations for Boron as a minor plant food element.

Literature and Quotations on Request

PACIFIC COAST BORAX CO.

Division of Borax Consolidated, Limited

51 Madison Ave., New York 10, N. Y.
2295 Lumber St., Chicago 16, Ill.
510 W. 6th St., Los Angeles 14, Calif.

AGRICULTURAL OFFICES:

P.O. Box 290, Beaver Dam, Wisc. • First National Bank Bldg., Auburn, Ala.

You will want this book

DIAGNOSTIC TECHNIQUES

For

Soils and Crops

Their Value and Use in Estimating the Fertility Status of Soils and Nutritional Requirements of Crops

HISTORICAL INTRODUCTION

by

Firman E. Bear

Chemical Methods for Assessing Soil Fertility
by Michael Peech

Correlation of Soil Tests With Crop Response to Added Fertilizers and With Fertilizer Requirement
by Roger H. Bray

Operation of a State Soil-Testing Service Laboratory
by Ivan E. Miles and J. Fielding Reed

Operation of an Industrial Service Laboratory for Analyzing Soil and Plant Samples
by Jackson B. Hester

Plant-Tissue Tests as a Tool in Agronomic Research
by Bert A. Krantz, W. L. Nelson and Leland F. Burkhart

Plant Analysis—Methods and Interpretation of Results
by Albert Ulrich

Biological Methods of Determining Nutrients in Soils
by Silvere C. Vandecaveye

Visual Symptoms of Malnutrition in Plants
by James E. McMurtrey, Jr.

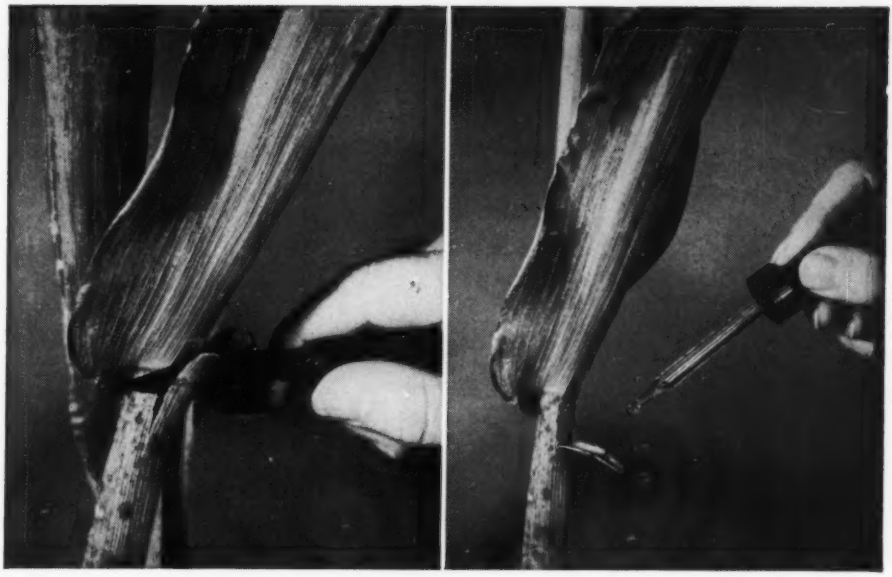
Edited by Herminie Broedel Kitchen, Associate Editor, Soil Science

Specially priced at $2.00 per copy

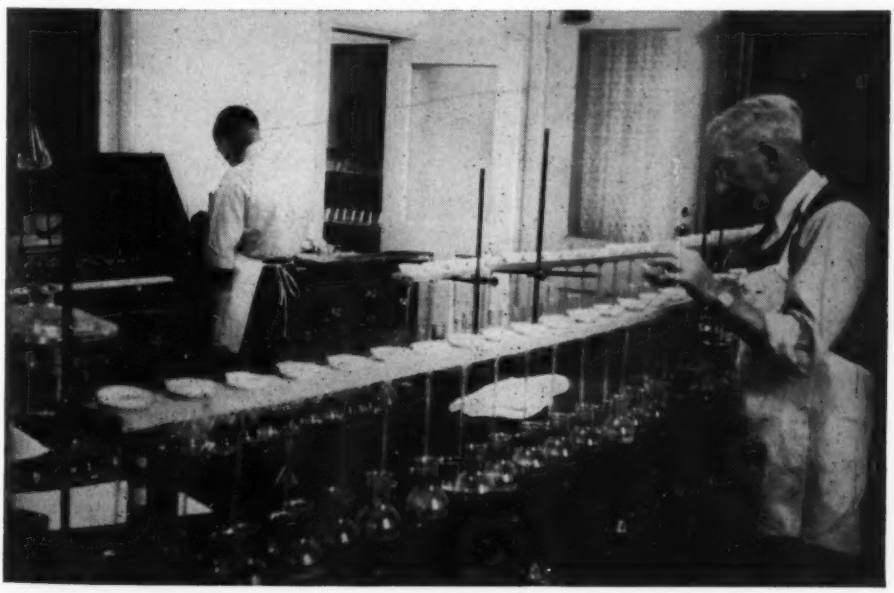
Copies can be obtained from:

AMERICAN POTASH INSTITUTE, Inc.

1155 Sixteenth St., N.W. **Washington 6, D. C.**



Nitrate tests can be made at the base of the leaf midrib without destroying the entire plant. This is an important consideration in making numerous tests on small experimental plots. The height of the plant at which nitrates are present as well as the intensity of the blue color gives an indication of the nitrate status of the plant.



Equipment used in a well-developed laboratory for soil analyses.

V-C Fertilizer is a properly-cured, superior blend of better plant foods.

V-C Fertilizer stays in good condition, when stored in a dry building.

V-C Fertilizer flows through your distributor, smoothly and evenly.

V-C Fertilizer encourages a good stand, uniform growth, bigger yields.

OUR FULL-TIME JOB

TO YOU, the selection and use of the best fertilizer is only one practice essential to your success in making your farm a better-paying business.

To V-C, however, the manufacture of the best fertilizer is a full-time job. The extra crop-producing power of V-C Fertilizers is the result of over 50 years of V-C scientific research, V-C practical farm experience and V-C manufacturing skill.

Since 1895, V-C factory experts, chemists and agronomists have constantly tested and developed new methods and new materials, to produce better and better V-C Fertilizers for every crop you grow.

If you want to give your soil the power to produce abundant yields, see your V-C Agent! Tell him you want V-C Fertilizers!

VC FERTILIZERS ®

VIRGINIA-CAROLINA CHEMICAL CORPORATION

401 East Main Street, Richmond 8, Virginia

Norfolk, Va. • Greensboro, N. C. • Wilmington, N. C. • Columbia, S. C.
Atlanta, Ga. • Savannah, Ga. • Montgomery, Ala. • Birmingham, Ala.
Jackson, Miss. • Memphis, Tenn. • Shreveport, La. • Orlando, Fla.
Baltimore, Md. • Carteret, N.J. • E. St. Louis, Ill. • Cincinnati, O. • Dubuque, Ia.